CHPS NORTH ELEMENTARY
NEW MEDIA CENTER AND
DROP-OFF

Project Number: 166006.01
CHPS Bid #: North-2018-1
State Project Code: 106-03-00-101
AUGUST 4, 2017
BID SET
Project Specifications

Architect: Enteros Design, P.C.
Civil Engineer: TIMMONS GROUP
Structural Engineer: LYNCH MYNKINS
MEP Engineers: Rick Hankins Consulting Engineers
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COLONIAL HEIGHTS, VA

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PROJECT NUMBER: 166006.01

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INVITATION TO BID

Bid Request No. North - 2018-1

Sealed bids for construction of the Additions and Renovation to North Elementary School, 3201 Dale Avenue, Colonial Heights, Virginia 23834, will be received in person, regular mail by U.S. Postal Service, or via special courier service at the school administration offices of Colonial Heights Public Schools, 512 Boulevard, Colonial Heights, Virginia 23834, until, but no later than 2:00 p.m., local prevailing time, September 28, 2017, and then publicly opened and read immediately thereafter.

The construction includes a new Media Center addition and student drop-off and associated site/utility work. The 4,314 square foot Media Center addition will incorporate a new lobby entrance and connecting corridor at the main entrance to the school. The addition will be one story with brick veneer, composite metal panel, and aluminum storefront glazing and it will complement the existing school while creating a prominent new focal point and entrance on the front façade. Other work involved with the project will include renovation of an existing space to provide a new electrical room (363 square feet) on the back of the existing cafeteria, and renovations to rooms adjacent to the existing Library room (433 square feet). An upgraded electrical service will be provided to and within the building along with modifications and replacement to some existing electrical panels and distribution. The new student drop off will include a new site entrance from Dale Avenue, and a vehicular drive aisle/drop off extending along the length of the front of the school. The existing parking lot will be modified and new parking spaces will be added along the new drop off. A new BMP for Stormwater will be provided and some existing Stormwater underground piping will be replaced as indicated on the Civil drawings. Existing underground utilities will be modified to accommodate the new work. The existing building and new addition is constructed as Construction Type IIB.

A Pre-Bid Conference will be held at 2:30 p.m. on August 30, 2017 at the site. This conference is not mandatory, but is recommended for potential bidders, as this will be the ONLY time bidders will be provided access to the building for review. Submit Questions in writing at this time. Bidders may also use DOCUMENT 006311 – BIDDER’S REQUEST FOR INFORMATION FORM to submit questions to Enteros Design. The last day available for questions shall be September 6, 2017, by 4:30 p.m. Responses will be in the form of addenda, if required.

Bids must be submitted on the designated bid form, completed in ink or typed, signed by an authorized representative, delivered in a sealed envelope bearing the bidder’s name, address, registration number, project name and acceptance date. Bids must be received by the Owner prior to 2:00 p.m. on the specified acceptance date. Bids by telephone, telegraph, and facsimile shall not be accepted.
The Owner intends to enter into a single stipulated sum contract. Bid Security in the form of an approved Bid Bond or a certified check for Five Percent (5%) of the Base Bid payable to Colonial Heights Public Schools will be required. If a Contract is executed, a Performance Bond and a Payment Bond each in the amount of One Hundred Percent (100%) of the contract amount, including additions and/or deductions, shall be required of the successful Contractor. When the agreement is executed, the bonds of the remaining bidders will be returned. The Bid Bond of the successful bidder will be retained until the Performance and Payment Bonds have been executed and approved, after which it will be returned.

Bidders are encouraged and have the option of also bidding on the Middle School project that will be simultaneously advertised. If the Bidder can provide cost savings through efficiency of working on both projects, this savings will be considered by the Owner. A line item on the Bid Form will be provided for each project to include a “discounted” price for each if pursuing both projects and a cost savings can be achieved. This amount will be deducted from the above base bid if both contracts are awarded to one contractor.

No bid may be withdrawn after the scheduled closing time for receipt of bids for ninety (90) calendar days except as provided in Section 2.2-4430, Procedure 1, Code of Virginia, which states the bidder shall give notice in writing of his claim to withdraw his bid within two (2) business days after the conclusion of the bid opening procedure and shall submit original work papers with such notice.

Bid Contract Documents consisting of Contract Drawings and Project Manual, may be obtained for download electronically as Adobe PDF files, by contacting the following local planrooms:

- Keith Fabry Planroom: (804) 649-7551
- ARC – Richmond: (804)355-8601
- The Blue Book: (804) 617-2478

These Adobe PDF documents will include the Drawings and Specifications. Notification of any Addenda will be advertised publicly on EVA, and the Addenda Documents will be posted to these same Planroom locations for access. The Bidders may use these documents for bidding purposes. Any costs associated with access to the documents and/or printing costs shall be at the expense of the bidder and shall not be reimbursed by the Owner.

Procedures for submitting a bid, claiming an error, withdrawal of bids, and other pertinent information are contained in the Instructions to Bidders. Owner reserves the right to reject any or all bids, select any or all alternates, and/or select any of the individualized bid prices as he deems appropriate, and to waive informalities in the bidding. If the bid from the lowest responsive, responsible bidder exceeds available funds, the Owner may negotiate with the low bidder to obtain a contract price within available funds or reject all bids.

Any questions relating to Bidding Documents should be directed to Enteros Design, at 804-861-1200.
Time is of the essence, and any bid received after the announced time and date for submittal, whether by mail or otherwise, will be rejected. It is the sole responsibility of the bidder for ensuring that their bids are stamped by Purchasing Department personnel or designated personnel before the deadline outlined above.

END OF INVITATION TO BID
DOCUMENT 002113 - INSTRUCTIONS TO BIDDERS

COLONIAL HEIGHTS PUBLIC SCHOOLS
CITY OF COLONIAL HEIGHTS, VIRGINIA

INSTRUCTIONS TO BIDDERS: Bid Request No. North - 2018-1
NORTH ELEMENTARY MEDIA CENTER
AND DROP-OFF

BID OPENING DATE: September 28, 2017, 2:00 PM

CITY OF COLONIAL HEIGHTS PUBLIC SCHOOLS CONTACT:
Troy Hedblom – Assistant Superintendent of Business Services, 804-524-3400
troy_hedblom@colonialhts.net

City of Colonial Heights Public Schools
512 Boulevard
Colonial Heights, VA 23834
Troy Hedblom, Assistant Superintendent of Business Services
(804) 524-3400
troy_hedblom@colonialhts.net
Sealed bids, subject to the plans, specifications and conditions contained herein and attached hereto, will be received at the above office until, but no later than **2:00 PM, September 28, 2017** for the construction of the North Elementary Media Center Addition, Renovation, and Drop-off.

Your bid to be considered must be submitted along with the forms referenced and provided in this Instructions to Bidders. Please keep a duplicate copy for your records. Bidders shall sign forms in the spaces provided without detaching from rest of the document and must return bid in its entirety to the above noted office/address. Bids shall be returned in a sealed envelope marked with the above Invitation Number, Bid Date and Project Name.

Time is of the essence, and any bid received after the announced time and date for submittal, whether by mail or otherwise, will be rejected. It is the sole responsibility of the bidder for ensuring that their bids are stamped by Colonial Heights Public Schools’ personnel or designated personnel before the deadline outlined above.

Nothing herein is intended to exclude any responsible firm or in any way restrain or restrict competition. On the contrary, all responsible firms are encouraged to submit proposals. The School System encourages all businesses, including minority and women-owned businesses to respond to all invitations to Bid and Request for Proposals.

All items shall be bid as specified or an approved equal unless the item specifically states no substitute. If bidding other than specified, complete specifications on each item quoted upon must be submitted with bid. Failure to comply with this requirement will be cause for rejection of bid.

No bid may be withdrawn after the scheduled closing time for receipt of bids for ninety (90) calendar days except as provided in Section 2.2-4430, Procedure 1, Code of Virginia, which states the bidder shall give notice in writing of his claim to withdraw his bid within two (2) business days after the conclusion of the bid opening procedure and shall submit original work papers with such notice.

Any contract amount over $25,000.00, the contractor must supply a copy of their Colonial Heights Business License.

Questions relating to this Invitation for Bid and Instructions to Bidders should be directed to the Architect, Enteros Design’s project manager Scott Wheeler, 804-861-1200 swheeler@enterosdesign.com.

**Examination of Facilities – Non-Mandatory Pre-Bid Conference.**

It shall be the full responsibility of all bidders to conduct a thorough and complete examination of the field conditions prior to submitting their bids. Failure of bidders to completely familiarize themselves with the conditions and requirements prior to submission of bid, shall in no way relieve the contractor of the responsibility of performing in such a manner as to meet or exceed the intent of the specifications.

The Prebid Meeting will be held on August 30th at 2:30 PM at North Elementary School. This date and time is the only time the contractor will have access to the school, so all bidders and sub-contractors are encouraged to attend.

**Bid and Construction Documents**

Fees, Permits, and Regulatory Requirements
The Contractor is responsible for investigating and understanding all fees, taxes, permits, inspections, and regulatory requirements of authorities having jurisdiction and has properly included in the submitted bid the cost of such fees, permits, and requirements not indicated as provided by the Owner. The contractor shall comply with these requirements and obtain and pay for all required permits, inspections, and fees.

List Subcontractors, Suppliers, and Manufacturers
Within 3 days of request by the Owner or the Architect, the Contractor will submit a list of potential subcontractors and suppliers he intends to use on the job. The list should include all subcontractors and suppliers providing work totaling three percent or more of the Bid amount. The Contractor shall not use any subcontractors or suppliers not indicated on that provided list without written authorization from the Owner.

Time Limit to Commence and Complete Work
The successful bidder shall commence work within ten (10) days after the Notice to Proceed is given to him by the School System. Once the Notice to Proceed has been issued, the successful bidder shall complete all the work by August 5, 2018. Liquidated damages, in the amount of $1,000 will be accessed for each and every calendar day that the work remains uncompleted.

Guarantee of Work
The contractor shall assemble and duly guarantee all warranties as required by these specifications. He shall assemble and deliver to the Colonial Heights Public Schools all bonds, guarantees, releases, etc. required by these specifications before final payment is made.

The contractor shall guarantee all work against defective workmanship and materials for a period of one (1) year after acceptance of the project by Colonial Heights Public Schools. The contractor at no cost shall make any equipment or work found to be faulty during this period good to the School System.

Proprietary Information
The Code of Virginia states: “Trade secrets or proprietary information submitted by a bidder, offeror, or contractor in connection with a procurement transaction shall not be subject to public disclosure under the Virginia Freedom of Information Act; however, the bidder, offeror, or contractor must invoke the protections of this section prior to or upon submission of the data or other materials, and must identify the data or other materials to be protected and state the reasons why protection is necessary.

Minority Bidders
The Colonial Heights Public Schools encourages all businesses, including minority and women-owned business to respond to all invitations to Bid and Requests for Proposals.

Availability of Funds
It is understood and agreed between the parties that Colonial Heights Public Schools shall be bound hereunder only to the extent of the funds available or which may hereafter become available for the purpose of this agreement.
Choice of Law and Venue

Any disputes under a resulting contract, that cannot be resolved between the Colonial Heights Public Schools and the contractor, must be resolved in the Circuit Court of the City of Colonial Heights. Any resulting contract shall be governed by the laws of the Commonwealth of Virginia. The contractor shall comply with all applicable federal, state and local laws and regulations.

Bid Guarantee – (Bid Bond Form Provided Must be Used)

Each proposal must be accompanied by a certified check equal or a bid bond equal 5% of the bid amount. Such Bid Bond or check shall be submitted with the understanding that it shall guarantee that the bidder will not withdraw his bid for a period of ninety (90) days after the scheduled closing time for receipt of bids, and that if his bid is accepted, he will enter into an agreement with the owner in accordance with the Form of Agreement as indicated herein. Any mistakes or error on the part of the bidder in preparing his bid confers no right upon the bidder to withdraw his bid after the designated time in said Contract and give stipulated Guarantee Bond within fifteen (15) days after written notification of award, the bidder in any particular hereof. Checks will be returned to the unsuccessful bidders promptly after it is determined who the successful bidder is and the award has been made.

Noncollusion Affidavit of Prime Bidder – (Form Provided Must be Used)

Each proposal must be accompanied by a properly executed and notarized copy of the Noncollusion Affidavit of Prime Bidder.

Guarantee Bond – (Form Provided Must be Used)

If awarded the contract, the contractor shall furnish a performance bond and a labor and material payment bond in the amount of the total contract price. This bond will stay into effect, until the one year warranty period is complete. The performance bond and labor and material payment bond shall be approved by the City Attorney.

In lieu of a bid, performance or payment bond, a bidder may furnish a certified check or cash escrow in the face amount required for the bond. Upon approval of the City Attorney, a bidder may furnish a personal bond, property bond or bank or saving and loan associations letter of credit on certain designated funds in the face amount required. Approval shall be granted only upon a determination that the alternative form of surety affords protection to the City equivalent to the corporate surety’s bond.

The contractor may require as part of the agreement between the subcontractor and the contractor, a payment bond with surety thereon in the amount of 100% of the work sublet to the subcontractor. Each such bond shall be constructed, regardless of language, as incorporating, within its provisions, the obligation to pay those persons who furnish labor or material as aforesaid; provided however, that subcontracts between the Contractor and the manufacture or a fabricator shall be exempt form the provision required a payment bond and provided further that subcontracts for less than $10,000 are also exempt hereunder.

Other Contract Documents – (Forms Provided Must be Used)

The Hold Harmless Agreement and Non-collusion Affidavit of Subcontractors shall be submitted by the successful bidder upon execution of the agreement. The Contractor’s Affidavit and Statement of Surety Company shall be submitted by the contractor with the request for final payment.
Termination of Contract

It shall be the sole right of Colonial Heights Public Schools to terminate any contract upon written thirty (30) day notification to the contractor.

Nondiscrimination Clause

In accordance with Section 2.2-4311 of the Code of Virginia, every contract for goods or services over $10,000 shall include the following provisions:

1. The contractor will not discriminate against any employee or applicant for employment because of disability, race, religion, sex or national origin except where religion, sex or national origin is a bona fide occupational qualification reasonably necessary to the normal operation of the contractor. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

2. The contractor, in all solicitations or advertisements for employees placed by or on behalf of the contractor, will state that such contractor is an equal opportunity employer.

3. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.

The contractor shall include the provisions of the foregoing paragraphs, 1, 2 and 3 in every subcontract or purchase order over $10,000 so that the provision will be binding upon each subcontractor or vendor.

Drug Free Workplace

In accordance with Section 2.2-4312 of the Code of Virginia, during the performance of this contract, the contractor agrees to:

1. Provide a drug-free workplace for the contractor’s employees
2. Post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, possession, or use of a controlled substance or marijuana is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition.
3. State in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace
4. Include the provisions of the foregoing clauses in every subcontract or purchase order over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

For the purpose of this section, “drug free workplace” means a site for the performance of work done in connection with a specific contract awarded to a contractor.

Faith-Based Organizations

In accordance with Code of Virginia, Section 2.2-4343.1, Colonial Heights Public Schools does not discriminate against faith-based organization.
Contractor’s Insurance

The Contractor shall purchase and maintain in force, at his own expense, such insurance as will protect him and the City and Colonial Heights Public Schools from claims which may arise out of or result from the Contractor’s execution of the work, whether such execution be by himself, his employees, agents, subcontractors or by anyone for whose acts any of them may be liable. The insurance coverage shall be such as to fully protect the Owner, the Engineer (if applicable) and the general public from any and all claims for injury and damage resulting by any actions on the part of the contractor or his forces as enumerated above. The Contractor shall furnish an original Certificate of Insurance, naming Colonial Heights Public Schools as an additional insured. Should any of the policies be canceled before the expiration date, the issuing company will mail 30 days written notice to the certificate holder.

The Contractor shall furnish insurance in satisfactory limits and on forms and of companies that are acceptable to the Owner’s Attorney and/or Risk Management and shall require and show evidence of insurance coverage on behalf of any subcontractors (if applicable), before entering into any agreement to sublet any part of the work to be done under this contract. The contractor will provide a minimum of liability insurance as indicated in the Supplementary General Conditions.

Certification of above insurance requirements will be required before the issuance of an award. Also required to be submitted with the insurance certificate is the complete address, phone number and contact person for the insurance company. The authorized agent signing on behalf of the insurance company must submit certification that they are a licensed agent to do business for the Company within the State of Virginia.

Certificate holder should be listed as – City of Colonial Heights Public Schools, 512 Boulevard, Colonial Heights, VA 23834

If the Certificate of Insurance Form being furnished is other than the City Form, the certificate of insurance must be modified by striking the words “endeavor to” in the second line and by striking the clause ‘but failure to mail such notice shall impose no obligation or liability of any kind upon the company, its agents or representatives.

Qualification of Bidders

The owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work and the bidder shall furnish to the owner all such information and data for this purpose as the owner may request. The owner reserves the right to reject any bid if evidence submitted by or investigation of such bidder fails to satisfy the owner that such bidder is properly qualified and responsible to carry out the obligations of the contract and to complete the work contemplated therein. Past performance on contracts for the School System, the City of Colonial Heights, or other agencies may be used in the determination of whether or not the contractor is a responsible bidder. Conditional bids will not be accepted.

Certification Regarding Sex Offenses:

Prior to awarding a contract for the provision of services that require the contractor or his employees to be in the presence of students during regular school hours or during school-sponsored activities, the school board will require the contractor and, when relevant, any employee who will have direct contact with students, to provide certification:

A. that he has not been convicted of or the subject of a pending charge for a felony or any offense involving the sexual molestation or physical or sexual abuse or rape of a child; and
B. whether he has been convicted of or the subject of a pending charge for a crime of moral turpitude (i.e. 1. Gross violation of standards or moral conduct, or vileness, such that an act was intentionally evil, making the act a crime. 2. Is a criminal behavior that gravely infringes on the moral sentiments of the community. Examples include murder, larceny, and aggravated assault. 3. Conduct done knowingly contrary to justice, honesty, or good morals.)

**Contractor Registration**

Contractors must be classified according to section 54.1-1100 of the Code of Virginia:

- “Class A contractors” perform or manage construction, removal, repair or improvement projects when (i) the total value referred to in a single contractor or project is $120,000 or more, or (ii) the total value of all such construction, removal, repair, or improvements undertaken by such person within any 12 month period is $750,000 or more.

- “Class B contractors” perform or manage construction, removal, repair, or improvements when (i) the total value referred to in a single contract or project is $7,500 or more, but less than $120,000, or (ii) the total value of all such construction, removal, repair or improvements undertaken by such person within any 12 month period is $150,000 or more, but less than $750,000.

- “Class C contractors” perform or manage construction, removal, repair, or improvements when (i) the total value referred to in a single contract or project is over $1,000 but less than $7,500, or (ii) the total value of all such construction, removal, repair, or improvements undertaken by such person within any 12 month period is less than $150,000.

The bidder shall place on the outside of the envelope containing the bid and shall place in the bid over his signature, the contractors class and license number.

If the bidder shall fail to provide this information on his bid or on the envelope containing the bid and shall fail to promptly provide such Contractor license to Colonial Heights Public Schools in writing when requested to do so before or after the opening of Bids, he shall be deemed to be in violation of Section 54.1-1115 of the Code of Virginia (1950) as amended, and his bid will not be considered. If a Bidder shall fail to obtain the required license prior to submission of his bid, the bid shall not be considered.
If Signature is other than the President, please furnish this office a letter of explanation for authority to sign for the President.

Name of Bidder ________________________________________________________________

Taxpayer’s Identification _____________________ Email Address _______________________

Complete Address __________________________________________________________________

Name (Type or Print) _______________________ Signature _____________________________

Date __________ Telephone number (____) __________ Fax Number (______) ____________

Contractors Class ___________________________ Contractors License Number __________

In compliance with Invitation for Bid North - 2018-1 and subject to all conditions thereof and attached thereto, the undersigned offers and agrees, if this Bid be accepted within 90 calendar days from the date of opening, to furnish any and all of the items upon which the prices are quoted.

My signature certifies that the accompanying proposal is not the result of or affected by, any unlawful act of collusion with another person or company engaged in the same line of business or commerce, or any act of fraud punishable under Title 18.2, Chapter 12, Article 1.1 of the Code of Virginia, 1950 as amended. Furthermore, I understand that fraud and unlawful collusion are crimes under the Virginia Governmental Frauds Act, the Virginia Government Bid Rigging Act, and Virginia Antitrust Act and Federal Law and can result in fines, prison sentences and civil damage awards.

My signature also certifies that this firm has no business or personal relationships with any other companies or personal that could be considered as a conflict of interest to the City of Colonial Heights or Colonial Heights Public Schools, and that there are no principals, officers, agents, employees, or representatives of this firm that have any business or personal relationship with any other companies or persons that could be considered as a conflict of interest or a potential conflict of interest to the City of Colonial Heights or Colonial Heights Public Schools, pertaining to any and all work or services to be performed as a result of this request and any resulting contract with the Colonial Heights Public Schools.

I hereby certify that I am authorized to sign as a Representative for the Firm.
BID BOND

KNOW ALL MEN BY THESE PRESENTS:

That we ________________________________________________
(hereinafter called “Principal”), as Principal and ________________________________________________,
a corporation duly organized under the laws of the State of _________________________________________,
(hereinafter called “Surety”), as Surety are held and firmly bound unto the Colonial Heights Public Schools, Colonial Heights, Virginia
(Hereinafter called “Oblige”) as oblige, in the sum of _____________________________________________
($______________) for the payment of which sum well and truly to be made, the said Principal and the said
Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally,
firmly by these presents.

Whereas, the Principal has submitted a bid to the oblige for ____________________________________

Now, therefore, if the oblige shall accept the bid of the Principal and the Principal shall enter into a contract
with the terms of such bid and give such bond or bonds as may be specified in the bidding or contract documents with
goods and sufficient surety for the faithful performance of such contract and for the prompt payment of labor and
materials furnished in the prosecution thereof, or in the event of the failure of the principal to enter into such contract and
give such bond or bonds, if the Principal shall pay to the Oblige the difference not exceed the penalty hereof between the
amount specified in said bid and such larger amount for which the Oblige may in good faith contract with another party to
perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and
effect.

Signed and sealed this _____________ day of ______________________________, 20___________
Attest:        ____________________________________________(Seal)
Principal
Attest:        By ____________________________________________
Title
Surety
Surety Countersigned:
By____________________________________  By____________________________________

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS 002113 - 9
NONCOLLUSION AFFIDAVIT OF PRIME BIDDER

State of _______________________________________

City of _______________________________________

County _______________________________________

_______________________________________________________________ Being first duly sworn, deposes and says that:

(1) He is______________________________________________, (owner, partner, officer, representative or agent)

of__________________________________________, the bidder has submitted the attached Bid:

(2) He is fully informed respecting the preparation and contents of the attached bid and of all pertinent circumstances respecting such Bid.

(3) Such Bid is genuine and is not a collusive or sham Bid;

(4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspire, connived or agreed, directly or indirectly with any other Bidder, firm or person to submit a collusive or Sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such contract or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the City of Colonial Heights, Colonial Heights Public Schools, or any person interested in the proposed Contract; and

(5) The price or prices quoted in the attached Bid are fair and proper are not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

___________________________________________
(Name)

___________________________________________
(Title)

Subscribe and sworn to before me this ________day of ___________, 20______

___________________________________________

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS 002113 - 10
HOLD HARMLESS AGREEMENT

I (we) __________________________________________, agree to the following provision relating to Indemnification of the CITY OF COLONIAL HEIGHTS and COLONIAL HEIGHTS PUBLIC SCHOOLS whereby:

(a) The Contractor shall indemnify and save harmless Colonial Heights Public Schools and the City, its agents and employees from and against all claims, damages, losses to persons or to property and expenses including attorneys’ fees alleged to have been caused through the negligent performance of any part of the work herein, whether such default be asserted to have been in the performance of any part of the work herein, whether such default be asserted to have been in the performance of a duty of employees, to the owners of property or to members of the public. Contractor shall be responsible to Colonial Heights Public Schools and the City for the acts and omissions of all person, firms or corporations directly or indirectly employed by contractor in connection with the work.

(b) In any and all claims against Colonial Heights Public Schools or any of their agents or employees by any employee of the Contractor or anyone directly or indirectly employed by them may be liable, the indemnification obligation under paragraph (a) shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor under workmen’s compensation act, disability benefit acts or other employee benefit acts. Insurance coverage specified in any part of this contract constitutes the minimum requirements and said requirements shall in no way lessen or limit the liability of contractor under the terms of the contract.

CONTRACTOR: __________________________________________________________

By: _____________________________________________

(Name and Title)

STATE OF __________________________________ of ________________________________________

To-WIT: I _______________________________________ a Notary Public in and for the ____________________________ aforesaid in the State aforesaid, do certify that ____________________________ ____________________________ whose name is signed to the above agreement bearing the date of ________________ __________ day of ____________________________, 20__________, personally appeared before me in my ____________________________ and State aforesaid and acknowledged the same as his / her act and deed.

My Commission expires the ________________ day of ____________________________, 20 ________________.
Given under my hand this ________________ day of _______________________. 20 ________________.

________________________________________
SIGNATURE OF NOTARY PUBLIC

PERFORMANCE AND PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, That we _______________________________ and
__________________________
____________________________________________ are held and firmly bound unto Colonial Heights Public Schools
and to the persons performing labor and furnishing materials in the just and full sum of _______________ Dollars; to
the payment whereof, well and truly made to Colonial Heights Public Schools, we bind ourselves and each of us jointly
and severally, firmly by these presents. Sealed with the seals of the parties hereto and dated this _________ day of
____________ in the year A.D., 20______.

The condition of the above obligation is such that whereas the above bound _______________________________
_________________________________________________________ did, on the ________ day of ________________,
20________
enter into a contract with the Colonial Heights Public Schools for _______________________________________
which contract is by reference thereto hereby expressly made a part of this bond..

Now if the said _______________________________ shall well and faithfully perform said contract, and each and every
condition, stipulation and requirement thereof, without default, and shall indemnify and save harmless Colonial Heights
Public Schools from any and all claims against the School System under the Virginia Workman’s compensation Act,
arising out of the performance of said contract or any work done in connection therewith, and from any and all damages,
either directly or indirectly arising out of any failure to perform the same, and shall pay all cost for labor, equipment,
vehicles, tools, appliances and materials any and all patent fees, and from any and all damages occasioned any party or
parties, in person or property, by the negligent doing of the work provide for by said contract, or negligent failure to
perform the conditions and requirements thereof, then the above obligation is to be void; otherwise the same shall remain
in full force and virtue.

The same (Bonding Co.) _______________________________ for value received, hereby stipulates
and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be
performed there under or the specifications accompanying the same shall in anywise affect its obligations of this bond,
and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or
to the work to be performed there under or the specifications accompanying the same. (N.B. – Where a firm gives bond,
all members of the firm should sign individually.)

IF A CORPORATION
Corporate Seal) President

Attest – Secretary

Attorney-in Fact

Bond – Continued (Acknowledgment – Corporate Principal)

OTHER THAN A CORPORATION

Countersigned

Resident Agent

Approved as to Form

City Attorney

State of __________________________ of __________________________

To wit: I __________________________ a Notary Public in and for the __________________________

aforesaid in the State aforesaid do certify

that __________________________

and __________________________ whose names as __________________________

and __________________________ respectively, of __________________________

are signed to the foregoing bond bearing date the _______________ day of __________________________

20________

personally appeared before me in my __________________________ and State aforesaid and acknowledged the same

in behalf of the said corporation, as its act and deed.

My commission expires the _______________ day of __________________________, 20________
Given under my had this __________________ day of __________________________, 20__________________

______________________________________
Notary Public

(Affidavit and Acknowledgment of Surety)

State of ___________________________________________ of _____________________________To wit:

I ______________________________________ a Notary Public in and for the ___________________________ and
State aforesaid,

Do certify that ____________________________________ whose name is signed to the foregoing bond bearing date this
____________________ day of ______________________________ 20______, personally appeared before me in my
__________________________ and State aforesaid and made oath that he is
______________________________________ of
________________________________________________; that he is duly authorized to execute the foregoing bond by
virtue of
a certain power of attorney of the said company dated the ____________ day of______________________________20________,

and recorded in the Office of the Clerk of the ____________________________ Court of
________________________________________________ Court of
Virginia, in Deed book ______________________ page ____________________; that the said Power of Attorney has
not
been revoked; and that the said company has complied with all the requirements of law regulating such companies in the

transaction

of business in the State of Virginia. And the said __________________________ thereupon, the in name and on behalf

of the said

company, acknowledged the foregoing bond as its act and deed.

My commission expires the __________ day of __________________________ 20_____.

Given under my hand this __________ day of __________________________ 20_____.

Approves as to form___________________________________________
________________________________________
CONTRACTOR’S AFFIDAVIT

PROJECT:
(NAME, ADDRESS)

STATE OF
COUNTY/CITY OF

Before me ____________________________, a Notary Public in an for said County/City

Personally appeared ______________________________________________

(name of duly authorized representative). ____________________________ (Title)

who being duly sworn according to law, deposes and says that all labor, material, and outstanding claims and I

indebtedness of whatever nature arising out of the performance of the contract between the COLONIAL HEIGHTS
PUBLIC SCHOOLS, COLONIAL HEIGHTS, VIRGINIA and

_______________________________________________________(Contractor) have been paid in full.

CONTRACTOR:
Address:

__________________________

Signature

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS
Subscribed and sworn to before me this___________ day of ______________________, _______________

Notary Public:___________________________________

My commission Expires___________________________

STATEMENT OF SURETY COMPANY

PROJECT:
(name, address)

Bond NO:   Contract Amount:  $    Contract Date:

In accordance with the provisions of the Contract between the COLONIAL HEIGHTS PUBLIC SCHOOLS, COLONIAL HEIGHTS, VIRGINIA, Owner, and

_____________________________________________________ (Contractor), the

(insert name and address of Surety Company), surety on the bond of said contractor, certifies that after a careful examination of the books and records of said Contractor, or after receipt of an affidavit from said Contractor, which examination or affidavit satisfies this company that all claims for labor and materials have been satisfactorily settled, hereby approves of the final payment to said Contractor, and by these presents witnesseth the payment to said Contractor of the final estimates shall not relieve the Surety Company of its obligations to COLONIAL HEIGHTS PUBLIC SCHOOLS, as set forth in the said Surety Company’s Bond.

IN WITNESS WHEREOF, the said Surety Company has hereunto set its hand and seal this
__________ day of ______________________, 20_____________.

Surety Company

Attest:

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS 002113 - 16
(Seal): _______________________________________ __________________________________________

Signature of Authorized Representative

__________________________________________

Title

Note: This statement, if executed by any person other than the President or Vice President of the Company, must be accompanied by a certificate of even date showing authority conferred upon the person so signing to execute such instruments on behalf of the Company represented.
1.1 BID INFORMATION

A. Bidder: ____________________________________________________.
B. Project Name: North Elementary New Media Center and Drop-off
C. Project Location: 3201 Dale Avenue, Colonial Heights, Virginia 23834
D. Owner: Colonial Heights Public Schools,
E. Owner Project Number: North - 2018-1
F. Architect: Enteros Design Architects, PC
G. Architect Project Number: 166006.01

1.2 CERTIFICATIONS AND BASE BID

A. Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by Enteros Design Architect, PC and Architect's consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

1. _______________________________ Dollars
2. ($______________________________).
3. The above amount may be modified by amounts indicated by the Bidder on the "Unit Prices" Section and "Alternates" Section.

B. Combined Bidding Option:

1. Bidders are encouraged and have the option of also bidding on the Middle School project that will be simultaneously advertised. If the Bidder can provide cost savings through efficiency of working on both projects, this savings will be considered by the Owner. Include below any “discount” to the above bid, if awarded both projects. This amount will be deducted from the above base bid if both contracts are awarded to one contractor.
   a. _______________________________ Dollars
   b. ($______________________________).
1.3 BID GUARANTEE

A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within [10] ten days after a written Notice of Award, if offered within [90] ninety days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached cash, cashier's check, certified check, U.S. money order, or bid bond, as liquidated damages for such failure, in the following amount constituting five percent (5%) of the Base Bid amount above:

1. ________________________________ Dollars ($__________).

2. Attached hereto is my bid security check for five percent (5%) of the Total Bid, made payable to Colonial Heights Public Schools.

B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the cash, cashier's check, certified check, U.S. money order, or bid bond.

1.4 TIME OF COMPLETION

A. The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by Owner, and shall achieve Substantial Completion, and all building systems fully operational and an Occupancy Permit obtained no later than August 5, 2018 for all Phases.

B. The owner and the Contractor recognize that time is of the essence and that the Owner will suffer financial loss if the Work is not completed by the Substantial Completion date required the Contract Documents (and as indicated above). Both parties recognize the delays, in expense and damages involved in proving in a legal preceding the actual loss suffered by the Owner if the Work is not completed on time. Accordingly, the Owner and the Contractor agree, stipulated and fix as liquidated damages if delayed, but not as a penalty, the sum of One Thousand Dollars ($1,000) that the Contractor together with the Contractor's surety shall pay the Owner for each calendar day or part thereof that expires after the date specified for the Substantial Completion of the Work.

1.5 ACKNOWLEDGEMENT OF ADDENDA

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

1. Addendum No. _____, dated ____________________.
2. Addendum No. _____, dated ____________________.
3. Addendum No. _____, dated ____________________.
4. Addendum No. _____, dated ____________________.

1.6 OVERHEAD AND PROFIT PERCENTAGE

A. For the Contractor, for Work performed by the Contractor’s own forces, _____ percent of the cost.

B. For the Contractor, for Work performed by the Contractor’s Subcontractors, _____ percent of the amount due the Subcontractors.

C. For each Subcontractor involved, for Work performed by that Subcontractor’s own forces, _____ percent of the cost.

D. For each Subcontractor involved, for Work performed by the Subcontractor’s Sub-subcontractors, _____ percent of the amount due the Sub-subcontractor.

1.7 BID SUPPLEMENTS (The following supplements are a part of this Bid Form.)

A. Bid Form Supplement - Alternates. (reference Section 012300 “Alternates”)

1. ALTERNATE NO. 1 (DEDUCTIVE)
   a. If this Alternate is accepted, the scope and cost of work, as indicated for the interior renovation work associated with rooms Reading E01, Reading E01, Janitor E03, Reading E103, and associated work in the adjacent corridor, shall be Deducted and removed from the Contract. All work, including but not limited to, walls, doors, frames, room finishes, HVAC, Plumbing, Electrical, and all general conditions costs and overhead and profit associated with this work, shall be included in the amount of cost to Deduct from the Contract for this Alternate.

   b. _______________________________ Dollars

   c. ($_________________________) (DEDUCTED FROM) the Total Base Bid.

2. ALTERNATE NO. 2 (DEDUCTIVE)

   a. If this Alternate is accepted, substitute the scope and cost of work, as indicated for (10) ten motorized window roller shades with manual roller shades of the same size/type. All work, including but not limited to motorized shades, controls, and associated Electrical wiring and work, and all general conditions costs and overhead and profit associated with this work, shall be included in the amount of cost to Deduct from the Contract for this Alternate.

   b. _______________________________ Dollars
c. $(_________________________) (DEDUCTED FROM) the Total Base Bid.

3. ALTERNATE NO. 3 (DEDUCTIVE)
   a. If this Alternate is accepted, substitute the scope and cost of work, as indicated for the porcelain tile flooring and wall base located in Lobby 102 and Corridor 105, with resilient floor (VCT) and rubber base. All work and all general conditions costs and overhead and profit associated with this work, shall be included in the amount of cost to Deduct from the Contract for this Alternate.
   
   b. ________________________________ Dollars

   c. $(_________________________) (DEDUCTED FROM) the Total Base Bid.

4. ALTERNATE NO. 4 (DEDUCTIVE)
   a. If this Alternate is accepted, the scope and cost of work, as indicated for eleven (11) parking spaces located at the north side of the existing parking lot, and as indicated on the Civil Drawings (see sheet C301), shall be Deducted and removed from the Contract. All work, including but not limited to, striping, asphalt pavement, subgrade stone and grading, and all general conditions costs and overhead and profit associated with this work, shall be included in the amount of cost to Deduct from the Contract for this Alternate.
   
   b. ________________________________ Dollars

   c. $(_________________________) (DEDUCTED FROM) the Total Base Bid.

5. ALTERNATE NO. 5 (DEDUCTIVE)
   a. If this Alternate is accepted, the scope and cost of work, as indicated for seal coating and restriping of the existing parking lot, and as indicated on the Civil Drawings (see sheet C301), shall be Deducted and removed from the Contract. All work, including but not limited to, seal coating and striping, and all general conditions costs and overhead and profit associated with this work, shall be included in the amount of cost to Deduct from the Contract for this Alternate.
   
   b. ________________________________ Dollars

   c. $(_________________________) (DEDUCTED FROM) the Total Base Bid.

6. ALTERNATE NO. 6 (DEDUCTIVE)
a. If this Alternate is accepted, the scope and cost of work, as indicated for Storm Sewer Replacement of the existing parking lot from C1 to C6, as indicated on the Civil Drawings, shall be Deducted and removed from the Contract. All work, including but not limited to, excavation, grading, storm sewer system components, backfilling, asphalt pavement and patching, and all general conditions costs and overhead and profit associated with this work, shall be included in the amount of cost to Deduct from the Contract for this Alternate.

b. ________________________________________________________ Dollars

c. ($_________________________) (DEDUCTED FROM) the Total Base Bid.

B. Bid Form Supplement - Unit Prices. (reference Section 012200 “Unit Prices”)

1. Unit Price No. 1: Additional Excavation
   a. $______________________ per cy (cubic yard)

2. Unit Price No. 2: Additional Excavation in Trenches
   a. $______________________ per cy (cubic yard)

3. Unit Price No. 3: Additional Excavation in Footings
   a. $______________________ per cy (cubic yard)

4. Unit Price No. 4: Mass Rock Excavations
   a. $______________________ per cy (cubic yard)

5. Unit Price No. 5: Rock Excavations in Trenches
   a. $______________________ per cy (cubic yard)

6. Unit Price No. 6: Rock Excavations in Footings
   a. $______________________ per cy (cubic yard)

7. Unit Price No. 7: Subsurface Drain
   a. $______________________ per lf (linear foot)

8. Unit Price No. 8: Dewatering
   a. $______________________ per gal (gallon)
9. Unit Price No. 9: Demolition of Existing Pavement  
   a. $__________________ per sf (square foot)  
   b. ____________________________________ Dollars

10. Unit Price No. 10: Fire Lane Striping and Signs  
    a. $__________________ per lf (linear foot for striping)  
    b. ____________________________________ Dollars  
    c. $__________________ per sign  
    d. ____________________________________ Dollars

C. Bid Form Supplement - Allowances. (reference Section 012100 “Sitework Allowances)  
1. Site Allowance No. 1: Additional Excavation  
   a. Included quantity of 140 c.y. @ $___________ per c.y.=  
   b. ($____________)  
   c. $__________________________ Dollars

2. Site Allowance No. 2: Additional Excavation in Trenches  
   a. Included quantity of 5 c.y. @ $___________ per c.y.=  
   b. ($____________)  
   c. $__________________________ Dollars

3. Site Allowance No. 3: Additional Excavation in Footings  
   a. Included quantity of 5 c.y. @ $___________ per c.y.=  
   b. ($____________)  
   c. $__________________________ Dollars

4. Site Allowance No. 4: Mass Rock Excavation  
   a. Included quantity of 1 c.y. @ $___________ per c.y.=  
   b. ($____________)  
   c. $__________________________ Dollars

5. Site Allowance No. 5: Rock Excavation in Trenches  
   a. Included quantity of 1 c.y. @ $___________ per c.y.=  
   b. ($____________)  
   c. $__________________________ Dollars

6. Site Allowance No. 6: Rock excavation at Footings  
   a. Included quantity of 1 c.y. @ $___________ per c.y.=  
   b. ($____________)  
   c. $__________________________ Dollars

7. Site Allowance No. 7: Subsurface Drain  
   a. Included quantity of 100 lf @ $___________ per lf =  
   b. ($____________)  
   c. $__________________________ Dollars

8. Site Allowance No. 9: VDOT #57  
   a. Site Allowance No. 9: VDOT #57  
   b. Included quantity of 20 c.y. @ $___________ per c.y.=  
   c. ($____________)  
   d. $__________________________ Dollars
9. Site Allowance No. 10: Woven Geotextile Fabric
   a. Included quantity of 0 c.y. @ $_______________ per c.y. =
   b. ($_______________)
   c. $_________________________________________ Dollars

10. Site Allowance No. 11: Firelane Striping and Signage
    a. Provide in the Base Bid an allowance of $500 for firelane striping
       and signage

D. It is the Owner’s intent to recommend the award of this Contract by the School
    Board of Colonial Heights (Owner) to the lowest responsive and responsible
    bidder based upon the Total Bid amount in its discretion, decides to award,
    provided the bid does not exceed the funds available. If approved by the
    Owner, a Notice of Award of the Contract for this project will be given by the
    Owner to the Contractor.

1. The undersigned agrees that when payment to the Contractor for
   additional work authorized is computed on the basis of actual cost of
   labor and materials, the percentage to be added/deducted thereto for
   the Contractor’s overhead and profit shall be not greater than the limits
   specified.

2. The undersigned agrees to use unit prices to determine changes to the
   Contract Sum when authorized changes are directed. Unit prices shall
   include all labor and materials, in place and complete. The source of the
   unit prices shall be Means Open Shop Building Construction Cost Data,
   The unit prices will be used as maximum limiting charges and minimum
   credits allowable for any changes in the work.

1.8 CONTRACTOR’S LICENSE AND REGISTRATION

A. The undersigned further states that it is a duly licensed contractor, for the type
   of work proposed, in Colonial Heights, Virginia, and that all fees, permits, etc.,
   pursuant to submitting this proposal have been paid in full.

B. The Undersigned is a licensed Class A Contractor in accordance with Chapter
   11, Title 54.1, Code of Virginia, as amended, Certificate No. _____________,
   dated ____/_____/____. 
1.9 SUBMISSION OF BID

A. By bidding in response to this invitation, the Bidder represents that in preparation and submission of this Bid, the said Bidder did not, either directly or indirectly, enter into any combination or arrangement with any person, firm, or corporation, or enter into any agreement, participate in any collusion, or otherwise take any action in restraint of free, competitive bidding in violation of Sherman Act (15 U.S.C Section 1) or Sections 59.1-9.1 through 59.1-9.17 or Sections 59.1-68.6 through 59.1-68.8 of the Code of Virginia.

B. Respectfully submitted this ___ day of ____________, 2017.

C. Submitted
By ______________________________________________________
(Name of bidding firm or corporation).

D. Authorized Signature:__________________________________________(Handwritten signature).

E. Signed By:______________________________________________________(Type or print name).

F. Title:__________________________________________________________ (Owner/Partner)

G. Witness By:______________________________________________________(Handwritten signature).

H. Street Address:___________________________________________________.

I. City, State, Zip___________________________________________________.

J. Phone / Fax: _____________________________________________________.

K. Email:___________________________________________________________.

L. License No.:_______________________________________________________.

M. Federal ID No.:___________________________________________(Affix Corporate Seal Here).
N. Indicate on the following blank line whether the bidder is a sole proprietor, a partnership, as corporation, or some other legal entity:
1. ________________________________________________

O. A bid by a corporation shall further give the State of incorporation ____________ and have the corporate seal affixed in the space provided above.

END OF DOCUMENT 004113
DOCUMENT 004314 – BIDDER’S REQUEST FOR INFORMATION FORM

Project: CHPS NORTH ELEMENTARY SCHOOL NEW MEDIA CENTER & DROP-OFF

To: Enteros Design
   314 Exchange Alley, Suite A
   Petersburg, VA, 23803
   Phone: 804-861-1200
   Fax: 804-861-1253
   Attn: Scott Wheeler
   Email: swheeler@enterosdesign.com

Bidder's Inquiry:

Submitted by (print):

Phone #:

Email:
1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

A. OVERVIEW

1. The following supplements modify AIA Document A201–2007, General Conditions of the Contract for Construction. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

B. Modify Section 1.1.1 to include the Invitation to Bid, Instructions to bidders as part of the Contract Documents.

1.2 ARTICLE 1 – GENERAL PROVISIONS

A. Add Section 1.2.1.1 to Section 1.2.1:

1. § 1.2.1.1 In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:
   a. Modifications.
   b. Agreement.
   c. Addenda, with those of later date having precedence over those of earlier date.
   d. The Supplementary Conditions.
   e. The General Conditions of the Contract for Construction.
   f. Division 1 of the Specifications.
   g. Drawings and Divisions 2–49 of the Specifications.
   h. Other documents specifically enumerated in the Agreement as part of the Contract Documents.

2. In the case of conflicts or discrepancies within or between Drawings and Divisions 2–49 of the Specifications, or within or among the Contract Documents and not clarified by Addendum, the contractor shall include the most restrictive or costly condition in his bid. The contractor shall submit a request for information to the Architect, preferably during bidding, and the Architect will determine which takes precedence in accordance with Sections 4.2.11, 4.2.12, and 4.2.13. If the resulting clarification results in a reduction in cost, the Contractor shall issue a credit deducting the difference from the Contract amount.

1.3 ARTICLE 2 – OWNER

A. Amend Section 2.2.5 to include:

1. The Owner shall furnish to the Contractor (1) electronic copy on disc of the Contract Document. The Contractor may use these to purchase at their own expense additional copies. The Contractor will be responsible for
1.4 ARTICLE 3 – CONTRACTOR

A. Add the following Section 3.2.5 to Section 3.2:
   1. 3.2.5 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for evaluating and responding to the Contractor’s requests for information that are not prepared in accordance with the Contract Documents or where the requested information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

B. Add Section 3.4.2.1 to Section 3.4.2:
   1. 3.4.2.1 After the Contract has been executed, the Owner and Architect will consider requests for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 1 of the Specifications). By making requests for substitutions, the Contractor:
      a. represents that it has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
      b. represents that it will provide the same warranty for the substitution as it would have provided for the product specified;
      c. certifies that the cost data presented is complete and includes all related costs for the substituted product and for Work that must be changed as a result of the substitution, except for the Architect’s redesign costs, and waives all claims for additional costs related to the substitution that subsequently become apparent; and
      d. shall coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

C. Add the following to the end of Section 3.4.2:
   1. 3.4.2.2 The Owner shall be entitled to reimbursement from the Contractor for amounts paid to the Architect for reviewing the Contractor’s proposed substitutions and making agreed-upon changes in the Drawings and Specifications resulting from such substitutions.

D. Add Section 3.12.11 to Section 3.12:
   1. 3.12.11 The Architect’s review of Contractor’s submittals will be limited to examination of an initial submittal and one (1) resubmittal. Required resubmittal reviews beyond the initial review and one resubmittal will require additional compensation for the Architect’s time and expense. The Owner shall be entitled to reimbursement from the Contractor for
amounts paid to the Architect for additional review of deficient contractor submittals. This compensation shall be included as a Change Order to be reflected as a reduction in the overall Contract amount.

1.5 ARTICLE 4 – ARCHITECT

A. Add Section 4.2.2.1 to Section 4.2.2:
   1. 4.2.2.1 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for site visits made necessary by the fault of the Contractor or by defects and deficiencies in the Work.

B. Add Section 4.2.7.1 to Section 4.2.7:
   1. The Architect's review period on any submittal will be 15 days after receipt of the submittal from the Contractor. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

   2. Provide one complete coordinated submittal for each individual Specification Section. Multiple-part sections of a Specification Section submitted separately will not be reviewed and will be returned Rejected as incomplete.

   3. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

   4. Coordinate transmittals of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

      b. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

   5. Resubmittal Review: Allow 15 days for review of each resubmittal. Time for review shall commence on Architect's receipt of submittal.

1.6 ARTICLE 5 – SUBCONTRACTORS

A. Add Section 5.2.5.1 to Section 5.2.5:
   1. 5.2.5.1 Not later than three (3) days after request from the Owner or Architect, the Contractor shall furnish in writing to the Owner through the Architect the names of persons or entities proposed as manufacturers or
fabricators for certain products, equipment and systems identified in the General Requirements (Division 1 of the Specifications) and, where applicable, the name of the installing Subcontractor. The Architect may reply within 14 days to the Contractor in writing stating 1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or 2) that the Architect requires additional time to review. Failure of the Owner or Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

2. 5.2.5.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

3. 5.2.5.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected manufacturer or fabricator was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute manufacturer’s or fabricator’s Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

4. 5.2.5.4 The Contractor shall not substitute a person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

1.7 ARTICLE 7 – CHANGES IN THE WORK

A. Amend Section 7.2.1 to read as follows:

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

1.8 ARTICLE 8 – TIME

A. Add the following Section 8.2.5.

1. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for additional construction administration time required beyond the date of Substantial Completion unless the Contract Time has been extended through approval by the Owner.
1.9 ARTICLE 9 – PAYMENTS AND COMPLETION

A. Add the following sentence to Section 9.3.1:

B. Add Section 9.3.1.3 to Section 9.3.1
   1. Retainage: 10% retainage of each progress payment will be held until Substantial Completion has been achieved as recommended by the Architect and approved by the Owner.

C. Add the following Section 9.8.3.1 to Section 9.8.3:
   1. 9.8.3.1 The Architect will perform no more than one (1) inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional inspections.

D. Add the following Section 9.10.1.1 to Section 9.10.1:
   1. 9.10.1.1 The Architect will perform no more than one (1) inspections to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for any additional inspections.

E. Add the following Section 9.11 to Article 9:
   1. 9.11 The Contractor and the Contractor’s surety, if any, shall be liable for and shall pay the Owner the sums hereinafter stipulated as liquidated damages, and not as a penalty, for each calendar day of delay after the date established for Substantial Completion in the Contract Documents, based on the schedule proved on the Bid Form, until the Work is substantially complete: Dollars ($1,000) per day.

1.10 ARTICLE 10 – PROTECTION OF PERSONS AND PROPERTY

A. Add the following Section 10.2.4.1 to Section 10.2.4:
   1. 10.2.4.1 When use or storage of explosives, or other hazardous materials, substances or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall give the Owner reasonable advance notice.

B. Add the following Section 10.2.4.2 to Section 10.2.4:
1. 10.2.4.2 If the Contract Documents require the Contractor to handle materials or substances that under certain circumstances may be designated as hazardous, the Contractor shall handle such materials in an appropriate manner.

1.11 ARTICLE 11 – INSURANCE AND BONDS

A. Sub-paragraph 11.1.1. On line 2, after the word “located, “insert the words “and which carry a Best’s Rating of A.VII or higher or are otherwise acceptable to the Owner,”
1. On line 2, after the word “Contractor,” insert the words “and the Owner.”

B. Sub-sub-paragraph 11.1.1.5. On line 1, delete the words “other than to the work itself.”

C. Sub-sub-paragraph 11.1.1.9. Add the following sub-sub-paragraph:

D. All insurance certificates and policies shall designate the Owner as an additional named insured.

E. Sub-sub-paragraph 11.1.1.10. Add the following sub-sub-paragraph:
1. The Contractor shall indemnify and save harmless the Owner against any liability, loss or expense (including loss of use) due to any act or omission of the Contractor, the subcontractors or any employees of the Contractor or subcontractors in connection with the Work or due to any omissions or supervisory acts of the Owner in connection with the Work.

F. Sub-paragraph 11.1.2. On line 2, second sentence delete the word “whether” and insert “which shall be”. 
1. On line 3, delete the words “or claims made”

G. 11.1.2.1. In accordance with the requirement of sub-paragraph 11.1.1, the Contractor shall provide the Owner with proof of liability insurance with limits as follows, before beginning the Work:
1. Worker’s Compensation
   a. Virginia Statutory limits

2. Employer’s Liability $1,000,000 per accident.

3. Commercial General Liability (including Contractor’s Protective Liability, Contractual Liability, Products/Completed Operations, Premises and Operations, Independent Contractor’s Protective Liability, Extended Bodily Injury and Broad Form Property Damage) having limits of no less than the following:
   a. Bodily Injury and $1,000,000 each occurrence Property Damage $2,000,000 aggregate per Project
b. Products and Completed Operations to be maintained for (two) years after final payment $2,000,000 aggregate

c. Property Damage Liability Insurance shall provide coverage for X, C, and U (Explosion, Collapse and Underground coverage) perils (contractor and sub-contractors).

d. Broad Form Property Damage Coverage (contractor and subcontractors) shall include completed operations.

e. Contractual Liability, (Hold Harmless Coverage) Bodily Injury and $1,000,000 each occurrence Property Damage $2,000,000 aggregate

f. Personal Injury $2,000,000 aggregate with employment exclusion deleted

4. Business Auto Liability (Including owned, non-owned and hired vehicle)
   a. Bodily Injury and $1,000,000 combined Property Damage Single Limit

5. Contractor’s Pollution Liability, if applicable, per the owner covering claims from third-party injury and property damage as a result of pollution conditions arising out of contractor’s operations and completed operations. Completed operations coverage shall remain in effect for no less than two (2) years after final completion.
   a. $1,000,000 Each Occurrence
   b. $2,000,000 Aggregate

6. Umbrella Liability Insurance policy covering the excess over the limits specified for all employer’s liability, commercial general liability, and business auto liability insurance required hereunder with minimum limits of $5,000,000 aggregate per policy year.

7. Each policy of liability insurance issued shall designate the Owner as an additional insured.

8. If this insurance is written on the Comprehensive General Liability policy form, the Certificate shall be AIA Document G705, Certificate of Insurance. If this insurance is written on a Commercial General Liability policy form, ACORD form 25 will be acceptable.

9. All insurance companies listed on certificates and on bonds, must possess a minimum A.M. Best rating of A and the financial size category rating of VII or higher.

10. The Contractor shall either (1) require each of its subcontractors to procure and maintain, during the life of its subcontract, subcontractor’s Liability Insurance of the same type and in the same amounts as specified in this Article or (2) insure the activities of its subcontractors in its own policy.

H. Sub-paragraph 11.1.3. On Line 4, after the word “Owner” add “Certificate shall state that coverage is in accordance with (contract no., IFB#).
I. Sub-paragraph 11.2 Delete this sub-paragraph and replace it with the following:
1. The Contractor shall purchase and maintain owner’s/contractors protective liability insurance, in amounts equal to the liability insurance which the Contractor is obligated to carry for itself pursuant to this Article, which shall protect the Owner against claims arising from operations under the Contract.

J. Sub-paragraph 11.3.1. Delete this sub-paragraph and replace it with the following:
1. The Owner will purchase and maintain property insurance on the Work located at the site, to the full insurable value thereof. The Contractor shall be responsible for the first $50,000 of each loss.
2. This “Builder’s Risk” insurance will include the interests of the Owner, the Contractor, subcontractors and sub-subcontractors as their interests may appear, and will include fire and extended coverage. This insurance may also include “all risk” insurance for physical loss or damage, including without duplication of coverage, theft, vandalism and malicious mischief. The Contractor shall purchase and maintain the same property insurance for portions of the Work stored off the site or in transit when such portions of the Work are to be included in an Application for Payment under sub-paragraph 9.6.1, if not covered under the Owner’s Builder’s Risk insurance or otherwise.

K. Sub-sub-paragraph 11.3.1.1. Delete this sub-sub-paragraph in its entirety.

L. Sub-sub-paragraph 11.3.1.2. Delete this sub-sub-paragraph in its entirety.

M. Sub-sub-paragraph 11.3.1.3. Delete this sub-sub-paragraph in its entirety.

N. Sub-sub-paragraph 11.3.1.4. Delete this sub-sub-paragraph in its entirety.

O. Sub-sub-paragraph 11.3.2 On line 5, delete “and the Owner and Contractor shall be named insured.”

P. Sub-paragraph 11.3.3. Delete the last sentence of this sub-paragraph.

Q. Sub-paragraph 11.3.4. On line 3, delete the word “shall” and replace it with the word “may.”

R. Sub-paragraph 11.3.5. Delete this sub-paragraph in its entirety.

S. Sub-paragraph 11.3.6. Delete this sub-paragraph in its entirety.

T. Sub-paragraph 11.3.7. Delete this sub-paragraph and replace it with the following:
1. The Contractor waives all rights against the Owner, its agents and employees for damages caused by fire or other perils, whether or not covered by insurance obtained pursuant to this paragraph 11.4 or any other Property Insurance applicable to the Work, except such rights as the Contractor may have to the proceeds of such insurance held by the Owner as Trustee. The Contractor shall require the Architect, separate contractors, subcontractors and sub-subcontractors to execute similar waivers in favor of the Owner.

U. Sub-paragraph 11.3.9. Delete this sub-paragraph in its entirety.

V. Sub-paragraph 11.3.10. After the word “power” on line 2, delete the remainder of this sub-paragraph.

W. Sub-paragraph 11.4.1. Delete this sub-paragraph and replace it with the following:

1. The Contractor shall indemnify and hold harmless the Owner from any and all damages arising out of any failure to perform any part of the Work, including payment for all labor and materials purchased by the Contractor in fulfilling this Contract, by procuring bonds each in the amount of one hundred percent (100%) of the Contract Price, with a surety company both authorized to transact business in the State of Virginia and satisfactory to the Owner. The bonds shall remain in full force during the Contract term and for twelve (12) months after the date of final payment. The bonds shall specifically mention the name of the Contractor and contract number.

X. Sub-paragraph 11.4.2 Delete this sub-paragraph in its entirety and replace with the following:

Y. The Contractor shall provide any required bonds upon request of the Owner.

1.12 ARTICLE 12 – UNCOVERING AND CORRECTION OF WORK

A. Add the following to the end of Section 12.2.2.2:

1. The guarantee period of any system or systems on which, due to seasonal limitations, required tests have not been successfully completed on the date of acceptance of the Project by the Owner shall begin on the date of first use by the Owner, provided that the required tests are successfully performed during the guarantee period. Otherwise, the guarantee period shall begin when the required tests have been successfully completed.

B. Add the following Section 12.2.2.4 to Section 12.2.2:

1. 12.2.2.4 Upon request by the Owner and prior to the expiration of one year from the date of Substantial Completion, the Architect will conduct
and the Contractor shall attend a meeting with the Owner to review the facility operations and performance.

1.13 ARTICLE 13 – MISCELLANEOUS PROVISIONS

A. Add the following to the end of section 13.1:
   1. Any litigation arising out of the performance, non-performance, or alleged breach of this Contract shall be brought in the Circuit Court of Colonial Heights, Virginia, and no other court.

B. Add the following to the end of Section 13.5.1:
   1. The Contractor will be responsible for coordinating the timing of tests and inspections.

C. Add the following Section 13.9 to Article 13:
   1. 13.9 Audit:
      a. 13.9.1 The Contractor’s records, which shall include but not be limited to accounting records, written policies and procedures, subcontract files (including proposals of successful and unsuccessful bidders), original estimates, estimating worksheets, correspondence, change order files (including documentation covering negotiated settlements) and any other supporting evidence necessary to substantiate charges relating to the Contract (all the foregoing hereafter referred to as “Records”) shall be open to inspection and subject to audit and/or reproduction during normal work hours by the Owner’s agent or its authorized representative to the extent necessary to adequately permit evaluation and verification of any invoices, payments, change orders or claims submitted by the Contractor or any of its payees pursuant to this Contract. The Records shall also include, but not be limited to, those Records necessary to evaluate and verify direct and indirect costs (including overhead allocations) as they may apply to costs associated with the Contract.
      b. 13.9.2 For the purpose of such audits, inspections, examinations and evaluations, the Owner’s agent or authorized representative shall have access to the Records from the effective date of the Contract, for the duration of the Work, and until three (3) years after the date of final payment by the Owner to the Contractor pursuant to the Contract.
      c. 13.9.3 The Owner’s agent or authorized representative shall have access to the Contractor’s facilities and to all necessary Records and shall be provided adequate and appropriate workspace in order to conduct audits. The Owner’s agent or its authorized representative shall give any auditee reasonable advance notice of intended audits.
d. 13.9.4 The Contractor shall require all subcontractors, insurance agents and material suppliers ("payee") to comply with the provisions of this paragraph by inserting the requirements of the paragraph in any written agreement between the Contractor and any payee. If the Contractor fails to require such an audit provision in any written agreement with a payee, the Owner shall be permitted to exclude some or all of the related payee’s costs from amounts payable to the Contractor pursuant to the Contract.

1.14 ARTICLE 15 – CLAIMS AND DISPUTES

A. Amend Section 15.1.2 by the following:
   1. Delete the Section and replace it with the following:
      a. Claims by the Contractor must be initiated by written notice to the Owner, with a copy sent to the Architect. The Contractor must initiate claims within 21 days after the occurrence of the event giving rise to the Claim or within 21 days after the Contractor first recognizes the condition giving rise to the Claim, whichever is later.

B. Amend Section 15.1.3 by the following:
   1. On the fourth line, delete the words “the decisions of the Initial Decision Maker” and replace them with “the Contract Documents.”

C. Add the following Sections 15.1.5.3 and 15.1.5.4 to Section 15.1.5:
   1. 15.1.5.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days’ increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim. The Contractor must submit documentation, weather records from NOAA, and similar documentation to substantiate the claim. The contractor must demonstrate that the circumstances are outside and in addition to what should be customarily expected from seasonal conditions are typical construction conditions. Extension for of Contract Time will only be granted if the Contractor provides that the circumstances impacted the Critical Path of the project.
   2. 15.1.5.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

D. Amend Section 15.2.6 by the following:
   1. Delete this Section in its entirety.
E. Amend Section 15.2.6.1 by the following:
   1. Delete this Section in its entirety.

F. Amend Section 15.2.8 by the following:
   1. Delete this Section in its entirety.
1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:

1. AIA Document A101, "Standard Form of Agreement between Owner and Contractor, Stipulated Sum."
   a. The General Conditions for Project are AIA Document A201 - 2007, "General Conditions of the Contract for Construction."

2. The General Conditions are referenced in the Contract Documents.
3. The Supplementary Conditions for Project are separately prepared and included in the Project Manual and are a part of the Contract.
4. The Instructions to Bidders is included in the Project Manual, and includes specific Colonial Heights Public Schools requirements and forms that must be included as part of the Contract.

1.2 ADMINISTRATIVE FORMS

A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.

B. Copies of AIA standard forms may be obtained from the American Institute of Architects; http://www.aia.org/contractdocs/purchase/index.htm; docspurchases@aia.org; (800) 942-7732.

C. Preconstruction Forms:

1. Form of Performance Bond and Labor and Material Bond: AIA Document A312, "Performance Bond and Payment Bond."

D. Information and Modification Forms:

1. Form for Requests for Information (RFIs): AIA Document G716, "Request for Information (RFI)."

E. Payment Forms:

1. Schedule of Values Form: AIA Document G703, "Continuation Sheet."
3. Form of Contractor's Affidavit: AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. Form of Consent of Surety: AIA Document G707, "Consent of Surety to Final Payment."

END OF DOCUMENT 008001
STATEMENT OF VUSBC SPECIAL INSPECTIONS
(STATE OWNED BUILDINGS)

DATE: August 4th, 2017

INSTITUTION/AGENCY: Colonial Heights
PROJECT TITLE: North Elementary School

The following firms and/or individuals (with address and telephone number shown) are designated to perform the Special Inspections required herein. The firm/individual has the experience, qualifications, certifications and/or licenses required to perform the functions indicated.

OWNER'S TESTING AND INSPECTION SERVICE

<table>
<thead>
<tr>
<th>OWNER'S TEST LAB</th>
<th>A/E of RECORD INSPECTION</th>
<th>SMOKE CONTROL INSPECTION &amp; TESTING</th>
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<tbody>
<tr>
<td>Name:</td>
<td>Enteros Design</td>
<td>Name:</td>
</tr>
<tr>
<td>Address (St):</td>
<td>314 Exchange Alley, Suite A</td>
<td>Address (St):</td>
</tr>
<tr>
<td>City, St., Zip:</td>
<td>Petersburg, VA 23803</td>
<td>City, St., Zip:</td>
</tr>
<tr>
<td>Phone:</td>
<td>804.861.1200</td>
<td>Phone:</td>
</tr>
</tbody>
</table>

OWNER'S PROJECT INSPECTOR

<table>
<thead>
<tr>
<th>Name:</th>
<th>Phone:</th>
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</thead>
<tbody>
<tr>
<td>Owner's Project Inspector</td>
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</table>

Inspection and/or Testing responsibilities are indicated on the attached List of Special Inspections, Form CO-6b. Copies of all test data and reports shall be provided to the Architect/Engineer of Record and to the Owner's Project Manager on a timely basis. The Contractor shall be notified of all deficiencies and discrepancies in a timely manner so that corrective action can be taken.

PROFESSIONAL OVERSIGHT AND CERTIFICATION

<table>
<thead>
<tr>
<th>STRUCTURAL ENGINEER OF RECORD</th>
<th>A/E of RECORD</th>
<th>SMOKE CONTROL RDP</th>
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<tbody>
<tr>
<td>Name: Lynch Mykins</td>
<td>Enteros Design</td>
<td>Name:</td>
</tr>
<tr>
<td>Address (St): 1503 Santa Rosa Rd, Suite 2110</td>
<td>314 Exchange Alley, Suite A</td>
<td>Address (St):</td>
</tr>
<tr>
<td>City, St., Zip: Richmond, VA 23229</td>
<td>Petersburg, VA 23803</td>
<td>City, St., Zip:</td>
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<tr>
<td>Phone: 804.346.3935</td>
<td>804.861.1200</td>
<td>Phone:</td>
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</tbody>
</table>

AGENCY REQUEST FOR APPROVAL

Submitting Agency: Enteros Design
Representative's Name: Lynch Mykins
Phone: 804.346.3935

CODE OFFICIAL'S ACCEPTANCE

☐ Acceptable as submitted
☐ Acceptable as marked

By: For or By Director
Division of Engineering & Buildings

Attachment: CO-6b List of Special Inspections
### FOUNDATIONS

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<thead>
<tr>
<th>MATERIAL/ACTIVITY</th>
<th>TYPE OF INSPECTION</th>
<th>THIS PROJ?</th>
<th>REFERENCE</th>
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<tbody>
<tr>
<td>Soil</td>
<td>Classify &amp; Test Existing Soils &amp; Fill Materials</td>
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<td>Piles</td>
<td>Driving Records, Tip &amp; Cutoff Elevations</td>
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### CONCRETE CONSTRUCTION

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* The numbers listed refer to notes on Page 7.
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**STEEL CONSTRUCTION**

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* The numbers listed refer to notes on Page 7.
# 2012 VUSBC SPECIAL INSPECTIONS

## 2012 VUSBC SPECIAL INSPECTIONS (STATE OWNED BUILDINGS)

### Project Code: North Elementary School

#### Project Title: North Elementary School

<table>
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#### SEISMIC FORCE RESISTANCE INSPECTIONS (as required by VUSBC 1705.11)

( Note: SDC refers to Seismic Design Category. )

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#### SEISMIC RESISTANCE TESTING (as required by VUSBC 1705.12)

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### WOOD & LIGHT GAGE STEEL CONSTRUCTION

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* The numbers listed refer to notes on Page 7.
### Fiber Proofing

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### Exterior Insulation & Finish Systems (EIFS)

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<td>Specs</td>
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### Smoke Control (see note 5)

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* The numbers listed refer to notes on Page 7.
NOTES:

1. Fabricator, supplier, ready-mixed plant or other production plant shall provide certificates from an approved independent inspection, testing or quality assurance agency attesting that the plant meets at least one of the following criteria:
   a. The plant is a certified production plant meeting the quality assurance standards of a recognized national standards organization for that product.
   b. The plant maintains an agreement with an independent inspection or quality assurance agency to conduct periodic in-plant quality assurance inspections. The frequency of these inspections shall not be less than one every six months.
   c. The plant has an in-shop quality assurance inspection program by an independent testing or quality assurance agency for the work/product to be provided on this project.

2. A/E shall review fabricator/supplier/producer certificates for conformance with appropriate standards of practice and quality assurance.

3. Contractor/supplier shall submit manufacturer's certificates of compliance for the materials/products.

4. Reviews records and test results for conformance with requirements.

5. Special inspection firm shall have expertise in fire protection engineering, mechanical engineering, and certification as an air balancer. The special inspector listed on the cover page and the Agency are responsible for verifying that the inspector(s) for smoke control is qualified as required by VUSBC 1705.17.2.

6. Unless noted otherwise, the reference numbers listed refer to the 2012 VUSBC.
GEOTECHNICAL ENGINEERING STUDY

Media Center and Student Drop-Off Loop
North Elementary School
Colonial Heights, Virginia
REPORT

PROJECT

Geotechnical Engineering Study
Media Center and Student Drop-Off Loop
North Elementary School
Colonial Heights, Virginia

CLIENT

Enteros Design
314 Exchange Alley, Suite A
Petersburg, Virginia 23803

SUBMITTED BY

Atlantic Geotechnical Services
10971 Richardson Road
Ashland, Virginia 23005

DATE

March 20, 2017
GEOTECHNICAL ENGINEERING STUDY

Media Center and Student Drop-Off Loop
North Elementary School
Colonial Heights, Virginia

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APPENDIX

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Figures 2 - 7: Logs of Borings
Figure 8: Reference Notes for Boring Logs
Figure 9: Standard Proctor Compaction
Figure 10: California Bearing Ratio
Table 1: Laboratory Test Results - Classifications
Table 1a: Laboratory Test Results
  – Proctor & California Bearing Ratio
Mr. Gil Entzminger  
Enteros Design  
314 Exchange Alley, Suite A  
Petersburg, Virginia 23803  

Reference: Geotechnical Engineering Study  
Media Center and Student Drop-Off Loop  
North Elementary School  
Colonial Heights, Virginia  

Dear Mr. Entzminger:  

Presented herein are the results of the Atlantic Geotechnical Services (A Division of Hillis-Carnes) [AGS] geotechnical engineering study for the proposed building and pavement additions to be constructed at this site.  

**Purposes and Scope of Work**  
The purposes of our geotechnical engineering study were to characterize subsurface conditions at the site and develop geotechnical recommendations for use in design and construction of building foundations and pavement for the proposed project.  

Our work was performed in the following phases:  

- Field Exploration Program  
- Laboratory Soil Testing  
- Engineering Evaluation/Analyses  

The results of our study, as well as our recommendations for foundation and pavement design and construction, are included in subsequent sections of this report.
Limitations

The analyses and recommendations presented in this report are based on the data obtained from five (5) soil borings drilled at this site as well as observations made during a cursory site walkover. The nature and extent of variations across the site may not become evident until construction commences. This is particularly pertinent to this site where a substantial amount of uncontrolled fill was found in some borings. If variations then appear evident, it may be necessary to reevaluate our recommendations after performing onsite observations and tests to establish the engineering significance of the variations.

The scope of our geotechnical engineering study does not include an environmental assessment of the air, soil or water conditions either on or adjacent to this site. No environmental opinions were prepared for or presented in this report.

Project Description

Planned improvements at the North Elementary School consist of construction of

- Media Center
- Outdoor/Enclosed Corridor
- Entrance Lobby/Covered Entrance
- Bus Loop
- Drop Off Aisle
- Parking Spaces

Light structural loads are anticipated for the proposed building additions. Retaining walls are not anticipated for this facility; consequently, design recommendations for such structural elements have not been included in this report.

Currently, the project site is both grassed and paved and the current grade is relatively flat.

Field Exploration Program

The geotechnical exploration consisted of drilling six (6) borings at the approximate locations shown on the Plan of Borings (Figure 1) in the Appendix of this report.
The borings were advanced using a truck-mounted drill rig and hollow-stem auger drilling techniques to depths varying from about 10 to 30 feet below existing grades. The boring locations were staked in the field prior to the start of drilling by a representative of AGS. Drilling and sampling activities were performed by Ayers & Ayers, Inc. of Powhatan, Virginia under the coordination of AGS personnel.

Soil samples were obtained in the borings using Standard Penetration Test (SPT) procedures (ASTM D 1586) at approximate 2-ft intervals to 10-ft depth and at 5-ft intervals thereafter. All soil samples obtained were sealed in protective containers and returned to our laboratory for further classification and testing. Logs of stratigraphic conditions encountered in these borings are presented on Figures 2 through 6 in the Appendix.

The soil types were logged by a geotechnical engineer. Detailed descriptions of soil conditions found in the borings and SPT test results are presented in the Appendix to this report. Soil samples were returned to our laboratory for testing.

Water levels in the open boreholes were measured at the completion of drilling, at which time the boreholes were backfilled with the soil auger cuttings for safety purposes. Water levels recorded in the boreholes at the time of our field exploration are presented on the respective boring logs.

**Laboratory Soil Testing Program**

All soil samples were visually classified by a staff engineer. Soil tests performed in our laboratory on recovered soil samples consist primarily of classification tests, i.e., moisture content, sieve analyses (percent passing No. 200 sieve) and Atterberg limits. The results of all tests are submitted in the Appendix.

All soil samples will be retained in our laboratory for thirty days following completion of this report, at which time they will be discarded unless further testing is requested by the Client.
Subsurface Conditions

A brief description of stratigraphic and groundwater conditions is presented in the following paragraphs. The boring logs provided in the Appendix of this report should be consulted for specific information concerning soil and groundwater conditions beneath this site.

Stratigraphy. The topsoil was measured to range in thickness from about 2 to 4 inches. What appears to be an under-compacted (probably uncontrolled) fill and/or weak, natural soils were detected in some borings (see table below). These soils are not suitable for shallow foundation construction.

<table>
<thead>
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<th>Boring No.</th>
<th>Thicknesses of Fill and/or Weak Soil, ft</th>
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<tbody>
<tr>
<td>B-1</td>
<td>4 - 8.5</td>
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<tr>
<td>B-1a</td>
<td>7.5 - 12</td>
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<td>B-2</td>
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<td>B-3</td>
<td>2</td>
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<tr>
<td>B-5</td>
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*Range indicates difficulty in discerning between fill and natural soils.

The natural soils beneath the topsoil and fill were typically medium dense to dense clayey and/or silty sands. The sands are of low plasticity with a measured liquid limit of 36, plasticity index of 17, and a sand content of 85 percent. Soil moisture was measured to be well below the plastic limit (see laboratory data in Appendix). What appears to be a very stiff Marine clay (based on color of dark gray) was found below 17-ft depth in the deepest boring. A petroleum odor was noted in the soil samples at about 6 to 7-ft depth in Boring No. B-1.

Ground Water. Upon completion of drilling, measurements conducted within the hollow stem augers prior to and in open boreholes after removal from the ground revealed boreholes with caving at about 1 to 8.5-ft depths. The borings had water in the
augers at depths of 6 to 17.5 ft. A better definition of groundwater levels would require installation of piezometers.

Based on the findings of the test borings, we anticipate the static groundwater table beneath this site exists about 6 to 7 feet below the existing ground surface. However, groundwater may exist on a transient basis beneath this entire site following periods of heavy or prolonged precipitation. Water may also be perched in the upper granular soil stratum. Such seepage may present problems to deeper construction excavations and mass grading.

**Foundation Design Recommendations**

**Design Considerations.** The following factors are expected to influence foundation design and construction at this site:

- This project site is characterized by a flat terrain. A native stratigraphy consisting of mostly medium dense to dense silty and/or clayey sands was detected (underlying fill in several borings).

- The existing fill is not suitable for support of foundation loads. Use of shallow foundations for support of the buildings will require undercut of the existing fill or extending of all footings down to strong, natural soils.

- Ground water is not expected to impact shallow foundation construction. However, the high groundwater will likely present issues with excavations in excess of about 5 ft. and will require dewatering.

- Conventional soil excavating, moving and compaction equipment is expected to suffice in completing mass earthwork and utility trench excavation activities at this site.

Based on the above design considerations and the structural loads anticipated, the structure may be supported on a shallow foundation bearing in either the strong, undisturbed native soils and/or compacted, select structural fill materials (where any existing fills are removed and replaced with structural fill). Recommendations for shallow foundation design are presented in the following sections, along with recommendations for accompanying site earthwork procedures assuming the existing fill.
and any underlying weak, native soils have been removed and replaced with structural fill.

**Foundation Types and Depths.** The structure may be supported on shallow spread and continuous footings bearing in the strong, undisturbed native soil and/or a controlled, compacted, structural fill at a minimum depth of 24 inches below perimeter finished grade provided the uncontrolled fill is removed and replaced.

**Footing Allowable Bearing Capacity.** Isolated spread and continuous footings bearing at the minimum specified depth in the strong, undisturbed native soils and/or compacted, select structural fill materials may be designed for a net allowable bearing pressure of 2,000 pounds per square foot (psf). This bearing capacity is expected to provide a factor of safety in excess of two (2) with respect to the shear strength anticipated for the stronger, native soils and well-compacted structural fill materials (see subsequent criteria). The structural fill materials should be selected and placed in accordance with the recommendations outlined in the Select Structural Fill section of this report.

Foundations must be proportioned so that the maximum net contact pressure under the combined effects of dead, live and transient loads does not exceed the allowable bearing pressure. To reduce the possibility of localized shear failure, we recommend a minimum reinforced foundation width of 24 inches for continuous footings, a minimum least plan dimension of 36 inches for isolated spread footings, and a minimum thickness of 12 inches for both spread and continuous footings. Total settlements of 1 inch or less are anticipated for footings proportioned using the above design parameters, with differential settlements estimated to be 1/2 inch or less.

**Seismic Design Considerations.** With respect to the 2012 International Building Code, we recommend a Site Area Classification of "D" be used for seismic design considerations for this site.
**Floor Slabs.** To provide the safest support, soil supported floor slabs should rest on strong, natural soils and/or compacted, select structural fill materials (which will require removal and replacement of the existing fill).

The soil supported floor slabs can be designed assuming the strong, natural soils and the compacted structural fill materials will provide a unit modulus of subgrade reaction of 100 to 200 pounds per square inch per inch deflection (pci), provided the site is prepared and the structural fill materials are selected and placed in accordance with the recommendations presented in the Site Preparation and Select Structural Fill sections of this report. **Moisture content in the slab subgrade soils must be kept within the structural fill criteria until after the completion of construction and then the building pad area protected from becoming excessively wet after construction.**

To provide a stable working pad and capillary moisture break beneath the slabs, we recommend the floor slabs bear on a minimum 4-inch thick cushion of VDOT No. 57 aggregate or other suitable open-graded stone. A suitable vapor barrier (such as plastic sheeting) should be placed over the stone to provide additional resistance against moisture migration into the concrete slabs.

**Drainage.** Surface and roof runoff and other water must be diverted from this site to reduce the chances of decreased bearing capacity and/or increased settlements resulting from water migration into the foundation soils. We recommend water be collected in roof drains and gutters and be piped to drainage structures.

**Construction Considerations - Earthwork**

**Site Preparation.** AGS recommends all existing fill (and any underlying weak, natural soils) be removed to provide safe bearing (for shallow foundations) and reasonable settlements beneath the building structure. Test pits can be useful in more accurately defining the horizontal and vertical limits of the uncontrolled fill and soft soil and better defining their composition. See the boring logs for depth of fill and soft material found in the borings.
Upon completion of removal of any soft soils and/or fill, areas ready to receive structural fill materials or ready for the next phase of construction should be proofrolled with a loaded, tandem-axle dump truck or equally heavy, pneumatic-tired equipment in the presence of the Geotechnical Engineer to help identify any remaining soft areas.

Weak, soft areas identified during proofrolling should be undercut further to strong soils at the discretion of the Geotechnical Engineer and the resulting excavations backfilled using structural fill materials selected and placed as described in a subsequent section of this report. In pavement areas, it may be possible to limit the undercut depth and bridge over (using stone and geogrid) the underlying weak material.

**Select Structural Fill.** Upon completion of proofrolling, placement of the structural fill materials may commence. Natural SC, CL and SM soils are suitable for use as structural fill. Highly plastic clays (CH) are not recommended for use as fill below the building slab.

With respect to imported materials, natural borrow materials classified as GC (clayey gravels) and SC (clayey sands) under the Unified Soil Classification System (USCS) are preferred for use as structural fill materials on this project. Some imported CL soils (such as sandy clays) may also be suitable for use as structural fill materials on this site, provided the sandy clays possess a liquid limit of less than 40, a plasticity index less than 20, and a sand content greater than 25 percent. Processed stone products such as VDOT No. 21A or 21B aggregate or VDOT No. 10 aggregate (screenings) may also be considered for use as structural fill materials on this project. Imported materials proposed for use as structural fill materials on this project should be submitted to AGS for visual assessment and final approval.

All structural fill materials should be placed in maximum 8-inch loose lifts and compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D 698 (standard Proctor compaction) procedures. Fill at depths in excess of
10 feet below final grade should be compacted to 98 percent standard Proctor density to reduce consolidation of the deeper fills. **The moisture content of the structural fill materials and natural subgrade soils should be established and maintained within plus or minus 2 percent of optimum moisture content until permanently covered and protected.**

AGS representatives should be present at the site during structural fill placement activities to ensure that the structural fill materials satisfy the selection and placement criteria presented in this report.

The above soil placement and compaction criteria also pertain to backfill materials for utility trench excavations traversing beneath the structure. If the onsite excavated soils are deemed unsuitable for reuse as backfill materials in trench excavations due to elevated moisture contents, the above selection criteria for structural fill materials remains applicable for imported trench backfill materials. The standard Proctor test revealed some of the soil to be significantly wet of its optimum moisture content.

**Preliminary Pavement Recommendations**

A preliminary pavement design was requested for this site. The laboratory CBR test (see Figure 9 in the Appendix) had a value of about 7.5 percent. Using a nominal factor of safety, we recommend a design CBR value of 5 percent be used for the final pavement design.

**Typical Pavement Sections.** A pavement section load-carrying capacity is compared to the anticipated traffic loading to help select pavement sections. We preliminarily recommend the following minimum pavement sections:
Heavy-Duty Flexible Pavement (Bus Loop)

**Thickness**

- SM-9.5 Asphalitic Concrete: 2 inches
- BM-25.0 Bituminous Base: 3 - 4 inches
- 21A or 21B Stone: 7 - 9 inches

Light-Duty Flexible Pavement (Auto Parking Only)  

**Thickness**

- SM-9.5 Asphalitic Concrete: 2 inches
- 21A or 21B Stone: 6 - 8 inches

We recommend the Project Civil Engineer use a design CBR of 5 percent for his final pavement designs. AGS can perform this final design if provided traffic loads.

All pavement materials (or their equivalents) and installation procedures should conform to Virginia Department of Transportation (VDOT) criteria presented in the most recent VDOT Bridge and Roadway Specifications.

A pavement design life normally assumes some action will be required on the pavement at about the quarter points of the design life. For maintenance budgeting, the following can be assumed for the 20-year life:

<table>
<thead>
<tr>
<th>Age, Years</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 5</td>
<td>Minor repairs in localized areas; possible slurry seal</td>
</tr>
<tr>
<td>10</td>
<td>Overlay (1.5 to 2 inches)</td>
</tr>
<tr>
<td>10 – 15</td>
<td>Slurry Seal</td>
</tr>
<tr>
<td>20</td>
<td>Reconstruction</td>
</tr>
</tbody>
</table>

Subgrade Preparation. The subgrade in proposed pavement areas should be prepared using the site preparation and select structural fill procedures recommended previously. However, we recommend the upper 12 inches of subgrade soil (fill) be compacted to 98 percent of standard Proctor compaction.
**Pavement Drainage.** Pavement designs assume the pavement is well drained. Water allowed to collect in the base course stone and/or on the subgrade can result in saturated conditions and a decreased pavement life. Therefore, adequate surface and subsurface drains should be provided to remove water from the pavement areas. We strongly recommend use of area drains and pavement subdrains to collect and discharge surface runoff and subsurface seepage. Weepholes should be provided in drainage structures to prevent ponding of water in and on the base materials.

**Use of Pavement Prior to Completion.** Pavement are sometimes either partially or fully completed when construction traffic is allowed access to them. Heavy construction traffic loading can be especially detrimental to a partially completed pavement section and can substantially reduce pavement life. Construction traffic loading is no: typically included in a pavement design analysis.
Atlantic Geotechnical Services appreciates the opportunity to be of service to you on this project. We hope this provides you with the information needed. Please call if you have any questions, or if we may be of additional assistance during the materials testing-quality control phase of the project.

Sincerely,

ATLANTIC GEOTECHNICAL SERVICES
(A Division of Hillis-Grimes)

Michael O. Noggle
Branch Manager

MON/ms
Enclosures

Copies Submitted: Above (2 bound, 1 unbound)
APPENDIX

Figure 1: Plan of Borings
Figures 2 - 7: Logs of Borings
Figure 8: Reference Notes for Boring Logs
Figure 9: Standard Proctor Compaction
Figure 10: California Bearing Ratio
Table 1: Laboratory Test Results – Classifications
Table 1a: Laboratory Test Results
    – Proctor & California Bearing Ratio
ATLANTIC GEOTECHNICAL SERVICES
Geotechnical - Material Testing - Environmental

PROJECT: Geotechnical Engineering Study
Media Center and Student Drop-Off Loop
North Elementary School
Colonial Heights, Virginia

Project Number: M16227
Scale: Not to Scale
Drawn by: N/A

PLAN OF BORINGS

FIGURE 1
**Colonial Heights, Virginia**

<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>SAMPLE NO</th>
<th>SAMPLE TYPE</th>
<th>SAMPLE DISTANCE (IN)</th>
<th>DESCRIPTION OF MATERIAL</th>
<th>FINES (%)</th>
<th>ELEVATION (FEET)</th>
<th>CALIBRATED PENETROMETER</th>
<th>TONS/FT²</th>
<th>WATER CONTENT (%)</th>
<th>PLASTIC LIMIT</th>
<th>LIQUID LIMIT</th>
<th>STANDARD PENETRATION (BLOWS/FT.)</th>
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<tbody>
<tr>
<td>0</td>
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<td></td>
<td>ASPHALTIC CONCRETE (5&quot;)</td>
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<td>3</td>
<td>2</td>
<td>SS 18</td>
<td></td>
<td>Soft Gray Sandy Lean CLAY (CL), Moist</td>
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<tr>
<td>6</td>
<td>3</td>
<td>SS 18</td>
<td></td>
<td>Very Loose Light Brown Clayey fine SAND (SC), Wet</td>
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<tr>
<td>9</td>
<td>4</td>
<td>SS 18</td>
<td></td>
<td>Medium Dense Light Brown Clayey fine SAND (SC), Wet</td>
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<tr>
<td>12</td>
<td>5</td>
<td>SS 18</td>
<td></td>
<td>Dense Light Gray Silty fine to medium SAND (SM), Wet</td>
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</tbody>
</table>

The stratification lines represent the approximate boundary lines between soil types. In-situ the transition may be gradual.

**WATER DEPTH IN BOREHOLE:**

<table>
<thead>
<tr>
<th>WATER DEPTH IN BOREHOLE</th>
<th>BORING STARTED</th>
<th>CAVE-IN DEPTH AT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>March 16, 2017</td>
<td>2.0 ft</td>
</tr>
</tbody>
</table>

**AFTER DRILLING:** 10.0 FT.

<table>
<thead>
<tr>
<th>DRILLING METHOD</th>
<th>Hollow Stem Auger</th>
</tr>
</thead>
</table>

**AFTER:**

<table>
<thead>
<tr>
<th>HRS:</th>
<th>FT.</th>
<th>DRILLER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ayers &amp; Ayers, Inc.</td>
</tr>
</tbody>
</table>

Figure 2
## Site Location

**Colonial Heights, Virginia**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Sample Distance (in)</th>
<th>Description of Material</th>
<th>Fines (%)</th>
<th>Elevation (Feet)</th>
<th>Calibrated Penetrometer</th>
<th>Tons/ft²</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>SS</td>
<td>18</td>
<td>TOPSOIL (3.5&quot;)</td>
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<td></td>
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<td>FILL: Brown Clayey Sand w/Organics</td>
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<tr>
<td>3</td>
<td>2</td>
<td>SS</td>
<td>18</td>
<td>FILL: Grayish-Brown Clayey fine Sand, Wet</td>
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<tr>
<td>6</td>
<td>3</td>
<td>SS</td>
<td>18</td>
<td>-Petroleum Odor below 6 ft</td>
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<td>10</td>
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<tr>
<td>4</td>
<td>4</td>
<td>SS</td>
<td>18</td>
<td>Very Loose Dark Brown Clayey fine SAND (SC), Wet [Possible FILL]</td>
<td></td>
<td>20</td>
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<tr>
<td>9</td>
<td>5</td>
<td>SS</td>
<td>18</td>
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<tr>
<td>12</td>
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<td></td>
<td></td>
<td>Dense Light Gray Silty fine SAND (SM), Saturated</td>
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<td>40</td>
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</tbody>
</table>

The stratification lines represent the approximate boundary lines between soil types. In-situ the transition may be gradual.

### Water Depth in Borehole
- After Drilling: 13.5 ft.

**Boring Started:** January 31, 2017
**Cave-in Depth at:** 1.0 ft

**Drilling Method:** Hollow Stem Auger

**Driller:** Ayers & Ayers, Inc.
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>SAMPLE DISTANCE (IN)</th>
<th>DESCRIPTION OF MATERIAL</th>
<th>FINE (%</th>
<th>ELEVATION (FEET)</th>
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<tr>
<td>0</td>
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<td>18</td>
<td>TOPSOIL ' 3&quot;'</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>FILL: Gravish-Brown Clayey Sand</td>
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<td></td>
<td></td>
<td></td>
<td>Medium Dense Light Brown Clayey fine to medium SAND (SC), Damp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>SS</td>
<td>18</td>
<td>-Light Gray below 2 ft</td>
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<td></td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>SS</td>
<td>18</td>
<td>Stiff Brown &amp; Light Gray Fat CLAY (CH), Damp</td>
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<tr>
<td>9</td>
<td>5</td>
<td>SS</td>
<td>18</td>
<td>Medium Dense Brown fine to coarse SAND (SW), Wet</td>
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</tbody>
</table>

**Calibrated Penetrometer**

<table>
<thead>
<tr>
<th></th>
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<th>2</th>
<th>3</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td>WATER CONTENT (%)</td>
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<td></td>
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<tr>
<td>PLASTIC LIMIT</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>LIQUID LIMIT</td>
<td></td>
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</tbody>
</table>

**Standard Penetration (BLOWS/FT.)**

<table>
<thead>
<tr>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
</table>

**Notes:**
- The stratification lines represent the approximate boundary lines between soil types; in-situ the transition may be gradual.
- Water depth in borehole: 7.0 ft.
- Boring started: January 31, 2017
- CAVE-IN DEPTH AT: 1.5 ft
- Drilling method: Hollow Stem Auger

**Driller:** Ayers & Ayers, Inc.
## Colonial Heights, Virginia

<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>SAMPLE NO.</th>
<th>SAMPLE TYPE</th>
<th>SAMPLE DISTANCE (IN)</th>
<th>DESCRIPTION OF MATERIAL</th>
<th>ELEVATION (FEET)</th>
<th>CALIBRATED PENETROMETER</th>
<th>WATER CONTENT (%)</th>
<th>PLASTIC LIMIT</th>
<th>LIQUID LIMIT</th>
<th>STANDARD PENETRATION (BLOWS/FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>SS</td>
<td>18</td>
<td>TOPSOIL (3.5&quot;)</td>
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<td></td>
<td>FILL: Brown Silty fine Sand [Possibly Natural]</td>
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</tr>
<tr>
<td>3</td>
<td>2</td>
<td>SS</td>
<td>18</td>
<td>Dense Brown Silty fine to coarse SAND (SW), Darrp</td>
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<tr>
<td>6</td>
<td>3</td>
<td>SS</td>
<td>18</td>
<td>-Medium Dense and Wet below 6 ft</td>
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</tbody>
</table>

The stratification lines represent the approximate boundary lines between soil types; in-situ the transition may be gradual.

**WATER DEPTH IN BOREHOLE:** 7.0 FT.
**BORING STARTED:** January 31, 2017
**CAVE-IN DEPTH AT:** 5.0 ft

**AFTER DRILLING:** 7.0 FT.
**BORING COMPLETED:** January 31, 2017
**DRILLING METHOD:** Hollow Stem Auger

**DRILLER:** Ayers & Ayers, Inc.
## Site Location

### Colonial Heights, Virginia

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample No.</th>
<th>Sample Type</th>
<th>Sample Distance (in)</th>
<th>Description of Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>SS</td>
<td>18</td>
<td>TOPSOIL (2&quot;)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FILL: Dark Brown Clayey Sand, Damp</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>SS</td>
<td>18</td>
<td>Dense Light Gray Silty fine SAND (SM), Damp</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>SS</td>
<td>18</td>
<td>Medium Dense Light Brown Silty fine to coarse SAND (SW), Wet</td>
</tr>
<tr>
<td>9</td>
<td>5</td>
<td>SS</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

### Calibration Penetrometer

<table>
<thead>
<tr>
<th>Tons/ft²</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Content (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastic Limit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Penetration (Blows/ft.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Figure 6**

**Notes:**
- The stratification lines represent the approximate boundary lines between soil types; in situ the transition may be gradual.
- Water Depth in Borehole: 6.0 ft.
- Boring Started: January 31, 2017
- Boring Completed: January 31, 2017
- Cave-in Depth at: -
- Drilling Method: Hollow Stem Auger
- Driller: Ayers & Ayers, Inc.
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>SAMPLE NO.</th>
<th>SAMPLE DISTANCE (IN)</th>
<th>DESCRIPTION OF MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>18</td>
<td>TOPSOIL (4&quot;)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>18</td>
<td>Dense Brown Silty fine to coarse SAND (SW), Damp</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>18</td>
<td>Wet and Medium Dense below 6 ft</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>18</td>
<td>Loose Light Brown Clayey fine to medium SAND (SC), Wet</td>
</tr>
<tr>
<td>15</td>
<td>5</td>
<td>18</td>
<td>Very Stiff Dark Gray Sandy Silty CLAY (CL), Damp</td>
</tr>
<tr>
<td>20</td>
<td>6</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>7</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>8</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>9</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES: IN-SITU THE TRANSITION MAY BE GRADUAL

WATER DEPTH IN BOREHOLE: 7.0 FT.
BORING STARTED: January 31, 2017
CAVE-IN DEPTH AT: 8.5 FT.
BORING COMPLETED: January 31, 2017
DRILLING METHOD: Hollow Stem Auger

DRILLER: Ayers & Ayers, Inc.
### Reference Notes for Boring Logs

<table>
<thead>
<tr>
<th>Sampling Symbol</th>
<th>Drilling Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS - Split Spoon Sampler</td>
<td>DC - Dutch Cone Penetrometer</td>
<td>DCP - Dynamic Cone Penetrometer</td>
</tr>
<tr>
<td>ST - Shelby Tube Sampler</td>
<td>RB - Rock Bit Drilling</td>
<td>HS - Hollow Stem Auger</td>
</tr>
<tr>
<td>RC - Rock Core; NX, BX, AX</td>
<td>BS - Bulk Sample of Cuttings</td>
<td>WS - Wash Sample</td>
</tr>
<tr>
<td>PM - Pressuremeter</td>
<td>PA - Power Auger (no sample)</td>
<td></td>
</tr>
</tbody>
</table>

### Correlation of Typical Sampler Penetration Resistances to Soil Properties

<table>
<thead>
<tr>
<th>Relative Density - Sands, Silts</th>
<th>Consistency of Cohesive Soils</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPT-N</td>
<td>Unconfined Compressive Strength, tsf</td>
</tr>
<tr>
<td>0 - 4</td>
<td>Under 0.25</td>
</tr>
<tr>
<td>5 - 9</td>
<td>0.25 - 0.49</td>
</tr>
<tr>
<td>10 - 29</td>
<td>0.50 - 0.99</td>
</tr>
<tr>
<td>30 - 49</td>
<td>1.00 - 1.99</td>
</tr>
<tr>
<td>50 - 80</td>
<td>2.00 - 3.99</td>
</tr>
<tr>
<td></td>
<td>4.00 - 8.00</td>
</tr>
</tbody>
</table>

SPT (in Blows/ft) refers to the blows required of a 140-lb hammer, falling 30 inches on a 2-inch O.D. Split-spoon sampler (as specified in ASTM D 1586) to drive the required sampler the last 12 inches. The blow count is commonly referred to as the N value; denoted by $\otimes$ on the boring logs.

### Unified Soil Classification Abbreviations

| GP - Poorly Graded Gravels | SW - Well Graded Sands | CL - Low Plasticity Clays |
| GW - Well Graded Gravels  | SM - Silty Sands       | CH - High Plasticity Clays |
| GM - Silty Gravels        | SC - Clayey Sands     | OL - Low Plasticity Organic Soils |
| GC - Clayey Gravels       | ML - Low Plasticity Silts | OH - High Plasticity Organic Soils |
| SP - Poorly Graded Sands | MH - High Plasticity Silts | CL/ML - Dual Classification (Typical) |

The recorded water levels are those water levels actually measured in the borehole at the times indicated. The measurements are relatively reliable when augering, without adding fluids, in a coarser granular soil. In clays and silts the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally needed.
COMPACATION TEST REPORT

Project No.: M16227
Project: North Elementary School Media Center
Client: Enteros Design
Source of Sample: P-1
Sample Number: Bulk
Depth: 0'-6'
Remarks:

MATERIAL DESCRIPTION

Description: Light Brownish-Gray Sandy Lean CLAY, trace of Mica

Classifications -
USCS: CL
AASHTO: A-6(9)

Nat. Moist. = 20.2 %
Liquid Limit = 34
Sp.G. =
Plasticity Index = 18
% < No.200 = 62.7 %

TEST RESULTS

Maximum dry density = 117.6 pcf
Optimum moisture = 12.4 %

Test specification:
ASTM D 698-12 Method B Standard

100% SATURATION CURVES FOR SPEC. GRAV. EQUAL TO:

- 2.8
- 2.7
- 2.6

Atlantic Geotechnical Services, Inc.

Figure 9

Tested By: FRB
Checked By: MON
BEARING RATIO TEST REPORT
ASTM D1883-16

Penetration Resistance (psi)

Penetration Depth (in.)

Swell (%)

Elapsed Time (hrs)

<table>
<thead>
<tr>
<th>Molded</th>
<th>Soaked</th>
<th>CBR (%)</th>
<th>Linearity Correction (in.)</th>
<th>Surcharge (lbs.)</th>
<th>Max. Swell (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (pcf)</td>
<td>Percent of Max. Dens. (%)</td>
<td>Moisture (%)</td>
<td>Density (pcf)</td>
<td>Percent of Max. Dens. (%)</td>
<td>Moisture (%)</td>
</tr>
<tr>
<td>1 ●</td>
<td>118.6</td>
<td>100.0</td>
<td>12.7</td>
<td>117.8</td>
<td>100.1</td>
</tr>
<tr>
<td>2 ▲</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 ■</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Material Description
Light Brownish-Gray Sandy Lean CLAY, trace of Mica

USCS | Max. Dens. (pcf) | Optimum Moisture (%) | LL | PI |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>117.6</td>
<td>12.4</td>
<td>34</td>
<td>18</td>
</tr>
</tbody>
</table>

Project No: M16227
Project: North Elementary School Media Center
Source of Sample: P-1 Depth: 0'-6'
Sample Number: Bulk
Date: 2-17-2017

Test Description/Remarks:
### TABLE 1 - LABORATORY TEST RESULTS

*Media Center and Student Drop-Off Loop*
*North Elementary School*
*Colonial Heights, Virginia*
*(AGS Report No. M16227)*

<table>
<thead>
<tr>
<th>Boring No.</th>
<th>Depth, ft.</th>
<th>Moisture Content, %</th>
<th>% Passing No. 200 Sieve</th>
<th>Plastic</th>
<th>Liquid</th>
<th>Plasticity Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1</td>
<td>1</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.5</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.5</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-2</td>
<td>1</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>8</td>
<td>15</td>
<td>19</td>
<td>36</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-3</td>
<td>1</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>10</td>
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</tr>
<tr>
<td></td>
<td>5</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boring No.</td>
<td>Depth, ft.</td>
<td>Moisture Content, %</td>
<td>% Passing No. 200 Sieve</td>
<td>Plastic</td>
<td>Liquid</td>
<td>Plasticity Index</td>
</tr>
<tr>
<td>------------</td>
<td>-----------</td>
<td>---------------------</td>
<td>-------------------------</td>
<td>---------</td>
<td>--------</td>
<td>-----------------</td>
</tr>
<tr>
<td>P-1</td>
<td>1</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0-5</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P-2</td>
<td>1</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE 1A
LABORATORY TEST RESULTS
PROCTOR/CALIFORNIA BEARING RATIO

Media Center and Student Drop-Off Loop
North Elementary School
Colonial Heights, Virginia
(AGS Report No. M16227)

<table>
<thead>
<tr>
<th>Boring No.</th>
<th>Atterberg Limits</th>
<th>% Passing No. 200 Sieve</th>
<th>Natural Moisture</th>
<th>Standard Proctor Compaction</th>
<th>Soaked CBR, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PL</td>
<td>LL</td>
<td>PI</td>
<td></td>
<td>Opt. Moist., %</td>
</tr>
<tr>
<td>B-2</td>
<td>16</td>
<td>34</td>
<td>18</td>
<td>63</td>
<td>20</td>
</tr>
<tr>
<td>B-5</td>
<td>19</td>
<td>36</td>
<td>17</td>
<td>15</td>
<td>8</td>
</tr>
</tbody>
</table>
SECTION 010100 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

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

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: Colonial Heights Public Schools, North Elementary School New Media Center and Drop-off.

1. Project Location: 3201 Dale Avenue, Colonial Heights, Virginia 23834

B. Owner: Colonial Heights Public Schools

C. Architect:

1. Enteros Design
   a. 314 Exchange Alley
   b. Petersburg, VA 23803
   c. 804-861-1200

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. The following information summarizes the requirements for new Media Center addition and student drop-off at North Elementary School in Colonial Heights Virginia. The Media Center addition will incorporate a
new lobby entrance and connecting corridor at the main entrance to the school. The addition will be one story with a brick veneer, composite metal panel, and aluminum storefront glazing; and it will complement the existing school while creating a prominent new focal point and entrance on the front façade. Other work involved with the new Media Center will include renovation of an existing space to provide a new electrical room on the back of the existing cafeteria, and moderate renovations to rooms adjacent to the existing Media Center. An upgraded electrical service will be provided along with modifications and replacement to some existing electrical panels and distribution (see Electrical drawings). The new student drop off will include a new site entrance from Dale Avenue, and a vehicular drive aisle/drop off extending along the length of the front of the school. The existing parking lot will be modified and new parking spaces will be added along the new drop off. A new BMP for Stormwater will be provided and some existing Stormwater underground piping will be replaced. (see Civil drawings). Existing underground utilities will be modified to accommodate the new work.

Building Statistics
Proposed Area:
- Media Center and Lobby: 4,314 GSF
- Classroom Renovation: 433 GSF
- New Electrical Room and Storage: 363 GSF

- Classification Cat: III
- Construction Type: IIB (Unprotected Non-Combustible)
- Fully Sprinkled: No
- Height: 1 story, (see drawings)
- Use Group: E (Education)

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

1.4 PHASED CONSTRUCTION
A. The Work shall be conducted in THREE (3) phases as indicated on the drawings.
B. Before commencing Work of each phase, submit an updated copy of Contractor’s construction schedule showing the sequence, commencement and completion dates, and move-out and -in dates of Owner’s personnel for all phases of the Work.

1.5 WORK UNDER SEPARATE CONTRACTS
A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
B. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
   1. Furnishings, fixtures, and equipment not included in this Contract.
   2. Wiring and configuration of computer equipment and telecommunications and A/V equipment.

C. Subsequent Work: Owner may award separate contract(s) for additional work to be performed at site following Substantial Completion. Completion of that work will depend on successful completion of preparatory work under this Contract.

1.6 ACCESS TO SITE

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

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, student, and public, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
      a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

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

1.7 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner will occupy the premises of the existing building during entire construction period, with the exception of areas under phased construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
   1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or
other occupied or used facilities without written permission from Owner and authorities having jurisdiction.

2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

3. Ensure that all Life Safety and Code required egress from occupied spaces are maintained as required.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.

2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.

3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.

4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.8 WORK IN EXISTING BUILDING

A. Refer to Contract Drawings for Work, including but not limited to: ducts, piping, diffusers, electrical fixtures, and wiring to be installed above existing ceilings.

B. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduits, as closely as practicable; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

1. When necessary, plan, design and provide temporary services, utilities, connections, temporary piping and heating, access and similar items to maintain continuous operations of the Owner's facility.

2. Any temporary system installation required for normal uninterrupted service will be the responsibility of the Contractor and no additional compensation will be provided.

C. There shall be no shutdown of electricity, water, sanitary/storm sewers, or heat/air conditioning during the life of the project unless approved in writing by the Owner.
1. The Contractor is advised that if existing system shutdowns are required, the shutdowns will not be allowed during normal school hours. Perform work continuously during critical system outages and tie-ins to prevent interruption to Owner's operations.

2. Work and service interruptions required in occupied areas of the existing facility should be performed on weekends, evenings, and other times when the facility is not in use. Access to such work should be requested from the Owner and the Architect in writing seven (7) calendar days prior to the date of the required access. Following execution of such work, the Contractor shall leave the occupied facilities in a condition equal to or better than that prior to commencement of the work.

3. Work and service interruptions requested by the Contractor should state in writing:
   a. Power outage and system shutdown requests should describe the reason, anticipated length of time, and areas affected by the outage.
   b. Requests should include any inspections and/or local utility inspections required at the time of the outage or tie-in.
   c. Provisions for temporary power should be provided for critical outages and shutdowns that could affect facility operations. All temporary provisions at to be provided at the Contractor's expense.

4. No construction material shall be stored in corridors at any time, nor shall any materials be stored in such a manner as to restrict emergency egress, both inside and outside the building. Space within the building for the storage of materials is very limited and the availability and locations of such spaces must be coordinated with and approved by the Owner.

5. Work in corridors may be undertaken only when the students and teachers are not in the building.

6. Immediately remove construction debris and clean any work area in an occupied area once the work is completed or halted for a significant period of time.

7. Coordinate use of pneumatic, gas powered, or other noise producing construction equipment with the Owner. Provide the Owner with a plan for using the equipment which eliminates the possibility of exhaust fumes from entering the occupied portions of the building.

8. If hoisting of equipment or materials over the building is required, coordinate times with the Owner. Coordinate loading-in construction materials in work areas with the Owner.

9. Dust and mop corridors every morning. Dust and mop any areas made dirty by construction operations on a daily basis.

10. Doors to construction areas must be locked. Temporary construction doors must have closers on them.

11. Fire extinguishers are required in all construction areas.

12. When existing windows and doors are removed and windows and doors are not installed, provide secure plywood covering over the window of the openings. No wall openings (no matter how small) shall be left uncovered.
13. Do not locate a mason saw near any window or door opening, or near a fresh air intake. Locate saws in fences in staging area only.
14. Do not perform any work which could cause the fire alarm to be inadvertently activated, without first contacting the Owner for approval.
15. Where the sequence of work requires work to be continuously performed in existing corridor ceiling spaces, wire tie all light fixtures, HVAC diffusers, and grilles at each corner to existing framing above, tie all smoke detection devices as close to the ceiling as possible, and secure all security, P/A, telephone or other wiring which is not conduit. Provide consistent and frequent vacuuming to minimize and control dust levels in work areas. Use of School supplies or equipment is prohibited. Postpone or reschedule work to a later shift whenever such work would disrupt or interfere with student testing. Coordinate with the school, the times for actual testing.
16. Clean all construction vehicles and motorized equipment on site so dirt and mud are not carried onto Owner’s roads, parking lots, and off-site public roadways. Keep on site roads and parking lots and if necessary, off site roadways cleaned of all direct and mud, on a daily basis.

1.9 WORK RESTRICTIONS

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

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

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 8:00 a.m. to 6:00 p.m., Monday through Friday, unless otherwise indicated.

1. Coordinate after-hours construction activities with the Owner prior to performing after hours work in the existing building.

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

1. Do not interrupt utilities serving facilities occupied by the Owner during regular school operating hours.
2. Notify Owner not less than four days in advance of proposed utility interruptions.
3. Obtain Owner’s written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

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

1.10 TESTING DAYS

A. There are scheduled testing days for the school during which noisy construction activities are not permitted. The contractor shall schedule noisy construction activities around scheduled testing days. Actual dates for testing will be determined by the Owner. Contractor shall coordinate noisy activities with the Owner prior to work as previously noted. The contractor shall request a calendar of anticipated testing days from the school prior to starting work. Actual dates and times are subject to modification by the Owner.

1.11 CERTIFICATION FOR PREVENTING SEXUAL PREDATOR ON-SITE

A. Per the Colonial Heights Public School Board policy, Contractor shall provide certification for all personnel on site per documents issued by the Owner. Contractor shall provide all forms prior to beginning construction.

1.12 RESTORATION WORK:

A. Wherever alteration and remodeling work within or immediately adjacent to the existing building requires cutting, patching, repair, restoration and/or replacement of existing floor, wainscot, base, wall, and ceiling finishes, the respective trade shall be required to execute the necessary restoration work.

B. Make all restoration and replacements where necessary using similar material, size, texture and finish to the original surfaces. Requirements for quality and workmanship for the Work shall also apply to restoration work. Restoration work shall be to satisfaction of the owner.

C. Walks, curbs, curbs and gutters, and paving over trenches shall be restored to original condition and the Contractor shall be responsible for any sinking in the walks, curbs, curbs and gutters, paving or backfill which may occur within one (1) year from acceptance by the Owner. Walks, curbs, curbs and gutters, and paving removed for trenching shall be saw cut before removal. Top soil and seed where the existing site is disturbed by installation of underground utilities and construction work.
1.13 BUILDING EGRESS

A. Safe egress from the building shall be maintained at all times.

B. Safe egress requirements include, but are not limited to the following:
   1. Normal public and service entrances used by the building occupants.
   2. Required exits as determined by authorities having jurisdiction.
   3. Safe means of egress from the building.

C. Provide safe egress when exiting means are disrupted by the building additions and renovations
   1. Maintenance of required exits includes:
      a. Exit access corridors.
      b. Exits.
      c. Ways of exit discharges.
   2. Maintenance of required exits includes, as required by the conditions of the Work, the provision of temporary facilities to provide alternate means of egress from the building.
   3. Maintenance of safe egress includes, as required by the conditions of the Work, the provisions of temporary facilities to provide alternate means of access to and egress from the building.
   4. All existing exit lights and exitways must remain operational, unless directly blocked by the new addition, and in such case a temporary alternate egress path must be provided and maintained. Egress shall be by means of hard surfaced, non-slip walkways, ramps, or other platforms, along with temporary handrail, barricade or canopies as required or indicated. Provide chain-link fence to form exterior egress exitways. Provide any required temporary lighting and lighted exit signs to meet code requirements for temporary means of egress.

1.14 GEOTECHNICAL ENGINEERING STUDY

A. A Geotechnical Engineering Study has been prepared by Atlantic Geotechnical Services, Inc. This report has been included for reference as part of this specification. It is for reference only, and is not meant to be part of the Contract Documents.

B. The Contractor has the right to perform additional testing at the Contractor’s expense.

1.15 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

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

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

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

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.16 DRAWINGS AND SPECIFICATIONS:

A. Contract Documents as defined in the General Conditions include Drawings and Specifications which together describe either graphically or in writing, contract requirements for the project. Drawings include plans, elevations, sections, schedules, details and other graphic representations as necessary to convey project scope and design character. Information contained on the drawings is general in nature and is not intended to address every specific condition. It is the intent of the Contract Documents that all framing, blocking, fasteners, hardware, finish materials, equipment and other items which may not necessarily be shown on the Drawings for every condition but which are necessary for the proper execution of the Work by the Contractor be included in the Contract for Construction.

B. In preparing his bid, it is the responsibility of the General Contractor to include all framing, blocking, fasteners, hardware, finish materials, equipment and other items necessary for the proper execution of the Work and reasonably inferable from the Contract Documents.

END OF SECTION 010100
SECTION 010200 – GENERAL SITEWORK REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SITEWORK LAYOUT
   A. Monuments and Benchmarks
      1. Maintain all monuments, property corners, bench marks and other reference points.
      2. If these are disturbed or destroyed during construction operations, have them replaced by a surveyor licensed in the Commonwealth of Virginia. This replacement shall be at no additional expense to the Contract.
   B. Laying out the Work.
      1. Locate all existing bench marks and other reference points.
      2. Protect these points throughout construction.
      3. Layout work utilizing these reference points.
   C. Record Drawings
      1. Maintain a record of the horizontal and vertical locations of all underground utilities and piping, both newly installed and existing encountered.
      2. Maintain a record of any variations of the work.
      3. Record Drawings shall be certified by a Land Surveyor registered in the Commonwealth of Virginia.
      4. Maintain record drawings throughout construction, recording information as work is performed. Record Drawings shall be available for periodic inspection during the course of the project.
      5. Submit final, complete record drawings at Substantial Completion.

1.3 EASEMENTS
   A. Verify the acquisition of all off-site easements and Rights-of-Way prior to the start of off-site construction. This may be done by contacting the Architect.
   B. Restore all off-site easements to the condition existing prior to the start of work.

1.4 MAINTENANCE OF TRAFFIC
A. Maintain vehicular and pedestrian traffic across the frontage of this project. Comply with all applicable safety requirements.

1.5 CORRELATION OF CONSTRUCTION DOCUMENTS
A. Review construction documents thoroughly prior to the start of construction.
B. Report any conflict or discrepancy discovered in the Construction Documents to the Architect prior to the start of construction.
C. Report any conflict or discrepancy discovered between the Construction Documents and state and local governmental regulations to the Architect prior to the start of construction.

1.6 PROJECT CONDITIONS
A. The conditions existing at the time of inspection for bidding purposes will be maintained by the Owner to the extent practical. However, minor variations may occur due to natural occurrences prior to the start of clearing work.
B. The location of existing underground utilities indicated is approximate only. Field locate all existing underground utilities in the area of work, regardless of whether or not they are indicated. Call “Miss Utility” prior to the start of demolition work for assistance in the location of existing underground utilities.
C. Should charted, uncharted or incorrectly charted utilities be encountered during demolition, contact the Architect immediately for instructions. Cooperate with Owner and utility companies to keep services and facilities in operation.

1.7 SCHEDULING
A. Refer to the Erosion and Sediment Plan sheets for the site phasing requirements.
B. Refer to the Architectural Plan sheets for the overall phasing requirements.

PART 2 - PRODUCTS

Not Applicable

PART 3 – EXECUTION

3.1 PROJECT CLEAN UP
A. Clean site as construction progresses. Do not allow trash or other waste materials to accumulate.
B. Prior to requesting the punch-list inspection, clean the site to the following requirements:
   1. Power wash all walks and pavements.
   2. The remainder of the site shall be broom clean.
   3. Remove all trash and debris.

3.2 EXISTING FACILITIES

A. Preserve existing signs, markers, guardrails, fences and other amenities in their original condition unless written permission is obtained for their removal and replacement.

B. Replace damaged items at no additional cost to the Contract.

END OF SECTION 010200
SECTION 012110 – SITEWORK ALLOWANCES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY
   A. This Section specifies administrative and procedural requirements regarding allowances associated with sitework.
   B. This Section includes the following unit price allowances:
      1. Additional Excavation
      2. Additional Excavation in Trenches
      3. Additional Excavation in Footings.
      4. Mass Rock Removal
      5. Trench Rock Removal
      6. Footing Rock Removal
      7. Subsurface Drain
      8. VDOT Std. No. 57 Stone
      9. Woven Geotextile Fabric
   C. This Section includes the following lump-sum allowances:
      1. Firelane Striping and Signage

PART 2 – PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICE ALLOWANCES
   1. Site Allowance No. 1: Additional Excavation
      a) Provide in the Base Bid an allowance of 140 c.y. for excavation of material, where authorized or directed, below or in addition to the levels required for the Work. Dispose of excavated material in an approved location on-site. Backfill with imported structural fill material compacted per specifications. Credit or additions to the Contract Price for actual quantities removed and replaced (based on volume of material cut) shall
be made per the Unit Prices contained in the Bid Form. Include in the unit price the cost of quantity verification by a Surveyor Licensed in the Commonwealth of Virginia.

2. Site Allowance No. 2: Additional Excavation in Trenches
   a) Provide in the Base Bid an allowance of 5 c.y. for excavation of material in trenches, where authorized or directed, below or in addition to the levels required for the Work. Dispose of excavated material in an approved location on-site. Backfill with stone compacted per specifications. Credit or additions to the Contract Price for actual quantities removed and replaced (based on volume of material cut) shall be made per the Unit Prices contained in the Bid Form. Include in the unit price the cost of quantity verification by a Surveyor Licensed in the Commonwealth of Virginia.

3. Site Allowance No. 3: Additional Excavation in Footings
   a) Provide in the Base Bid an allowance of 5 c.y. for excavation of material in footings, where authorized or directed, below or in addition to the levels required for the Work. Dispose of excavated material in an approved location on-site. Backfill with stone compacted per specifications. Credit or additions to the Contract Price for actual quantities removed and replaced (based on volume of material cut) shall be made per the Unit Prices contained in the Bid Form. Include in the unit price the cost of quantity verification by a Surveyor Licensed in the Commonwealth of Virginia. Any required lowering of footings will be done as a negotiated price.

4. Site Allowance No. 4: Mass Rock Excavation
   a) Provide in the Base Bid an allowance of 1 c.y. for excavation of rock. Dispose of excavated rock material in an approved location on-site. Backfill with imported fill material compacted per specifications. Credit or additions to the Contract Price for actual quantities removed and replaced (per the pay limits established in the Specifications) shall be made per the Unit Prices contained in the Bid Form. Include in the unit price the cost of quantity verification by a Surveyor Licensed in the Commonwealth of Virginia.

5. Site Allowance No. 5: Rock Excavation in Trenches
   a) Provide in the Base Bid an allowance of 1 c.y. for excavation of rock in trenches. Dispose of excavated rock material in an approved location on-site. Backfill excavation with stone. Credit or additions to the Contract Price for actual quantities removed and replaced (per the pay limits established in the Specifications) shall be made per the Unit Prices contained in the Bid Form. Include in the unit price the cost of quantity verification by a Surveyor Licensed in the Commonwealth of Virginia.
6. Site Allowance No. 6: Rock excavation at Footings  
   a) Provide in the Base Bid an allowance of 1 c.y. for excavation of rock in footings. Dispose of excavated rock material in an approved location on-site. Backfill excavation with stone. Credit or additions to the Contract Price for actual quantities removed and replaced (per the pay limits established in the Specifications) shall be made per the Unit Prices contained in the Bid Form. Include in the unit price the cost of quantity verification by a Surveyor Licensed in the Commonwealth of Virginia.  

7. Site Allowance No. 7: Subsurface Drain  
   a) Provide in the Base Bid an allowance of 100 l.f. of subsurface drain as detailed on Drawing C-503.  

8. Site Allowance No. 9: VDOT #57 aggregate, in place 20 C.Y.  
9. Site Allowance No. 10: Woven Geotextile Fabric, in place 0 S.Y.  

3.2 SCHEDULE OF LUMP SUM ALLOWANCES  
A. Firelane Striping and Signage  
   1. Provide in the Base Bid an allowance of $500 for firelane striping and signage as directed by the Architect.  

3.3 ADMINISTRATION OF SITEWORK UNIT PRICE ALLOWANCES  
A. Unit Prices for each allowance shall be given on the Bid Form.  
   1. The Owner reserves the right to negotiate said Unit Prices prior to the award of Contract.  
B. Allowances required by this Section shall be included in the Base Bid amount.  
C. Allowances required by this Section shall be indicated on the Schedule of Values and shall be determined by multiplying the quantity indicated by the unit price given on the Bid Form.  
D. Submit invoices or surveyor’s certificate, as required, with pay requests that involve the Unit Price Allowances.  
E. Credit unused amount of Unit Price Allowance (if any) to Owner by Change Order at Project Closeout.  

3.4 ADMINISTRATION OF LUMP-SUM ALLOWANCES  
A. Conform to the requirements of the General Conditions.  

END OF SECTION 012110
SECTON 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Section:
   1. Division 01 Section “Sitework Allowances” for coordination with sitework allowances and unit prices.
   2. Division 01 Section “Contract Modification Procedures” for procedures for submitting and handling Change Orders.

1.2 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

C. List of Unit Prices: A schedule of unit prices is included in Part 3.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

SCHEDULE OF UNIT PRICES

Unit Price No. 1: Additional Excavation
1. Description: Undercut and disposal offsite of unsuitable/unstable material to depth as described in the Geotechnical Reports, as a part of general site excavation and replacement with imported structural fill material compacted in place.
2. Unit of Measurement: Cubic yard.

Unit Price No. 2: Additional Excavation in Trenches
3. Description: Undercut and removal offsite of unsuitable/unstable material to depth as described in the Geotechnical Reports, in trench excavations and replacement with VDOT #57 stone material compacted in place.
4. Unit of Measurement: Cubic yard.

Unit Price No. 3: Additional Excavation in Footings
1. Description: Undercut and removal offsite of unsuitable/unstable material to depth as described in the Geotechnical Reports, in footing excavations and replacement with VDOT #57 stone material compacted in place.
2. Unit of Measurement: Cubic yard.

Unit Price No. 4: Mass Rock Excavations
3. Description: Mass Rock Excavation if encountered for excavation of rock, offsite disposal and replacement with imported structural fill material, in place.
4. Unit of Measurement: Cubic yard.

Unit Price No. 5: Rock Excavations in Trenches
5. Description: Trench Rock Excavation for excavation if encountered of rock, offsite disposal and replacement with VDOT #57 stone material, in place.
6. Unit of Measurement: Cubic yard.

Unit Price No. 6: Rock Excavations in Footings
1. Description: Footing Rock Excavation for excavation if encountered of rock, offsite disposal and replacement with VDOT #57 stone material, in place.
2. Unit of Measurement: Cubic yard.

Unit Price No. 7: Subsurface Drain

1. Description: Subsurface drain as detailed on Drawing C-503
2. Unit of Measurement: (per LF)

Unit Price No. 8: Dewatering

3. Description: Dewatering of site or excavations and disposal of water off site.
4. Unit of Measurement: Gallon.

Unit Price No. 9: Demolition of Existing Pavement

a. Unit of Measurement: (per SY)

Unit Price No. 10: Fire Lane Striping and Signs

a. Unit of Measurement: (per LF for striping)
   b. Unit of Measurement: (per sign)

END OF SECTION 012200
SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

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

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

2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum. The amount of each alternate shall include the cost of materials, labor, and general conditions/profit for both subcontractors and general contractor.

1.3 PROCEDURES

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

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

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

C. Execute accepted alternates under the same conditions as other work of the Contract.
D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. ALTERNATE NO. 1 (DEDUCTIVE)
1. If this Alternate is accepted, the scope and cost of work, as indicated for the interior renovation work associated with rooms Reading E01, Reading E01, Janitor E03, Reading E103, and associated work in the adjacent corridor, shall be Deducted and removed from the Contract. All work, including but not limited to, walls, doors, frames, room finishes, HVAC, Plumbing, Electrical, and all general conditions costs and overhead and profit associated with this work, shall be included in the amount of cost to Deduct from the Contract for this Alternate.

B. ALTERNATE NO. 2 (DEDUCTIVE)
1. If this Alternate is accepted, substitute the scope and cost of work, as indicated for (10) ten motorized window roller shades with manual roller shades of the same size/type. All work, including but not limited to motorized shades, controls, and associated Electrical wiring and work, and all general conditions costs and overhead and profit associated with this work, shall be included in the amount of cost to Deduct from the Contract for this Alternate.

C. ALTERNATE NO. 3 (DEDUCTIVE)
1. If this Alternate is accepted, substitute the scope and cost of work, as indicated for the porcelain tile flooring and wall base located in Lobby 102 and Corridor 105, with resilient floor (VCT) and rubber base. All work and all general conditions costs and overhead and profit associated with this work, shall be included in the amount of cost to Deduct from the Contract for this Alternate.

D. ALTERNATE NO. 4 (DEDUCTIVE)
1. If this Alternate is accepted, the scope and cost of work, as indicated for eleven (11) parking spaces located at the north side of the existing parking lot, and as indicated on the Civil Drawings (see sheet C301), shall be Deducted and removed from the Contract. All work, including but not limited to, striping, asphalt pavement, subgrade stone and grading, and all general conditions costs and overhead and profit associated with this work, shall be included in the amount of cost to Deduct from the Contract for this Alternate.
E. ALTERNATE NO. 5 (DEDUCTIVE)
   1. If this Alternate is accepted, the scope and cost of work, as indicated for seal coating and restriping of the existing parking lot, and as indicated on the Civil Drawings (see sheet C301), shall be Deducted and removed from the Contract. All work, including but not limited to, seal coating and striping, and all general conditions costs and overhead and profit associated with this work, shall be included in the amount of cost to Deduct from the Contract for this Alternate.

F. ALTERNATE NO. 6 (DEDUCTIVE)
   1. If this Alternate is accepted, the scope and cost of work, as indicated for Storm Sewer Replacement of the existing parking lot from C1 to C6, as indicated on the Civil Drawings, shall be Deducted and removed from the Contract. All work, including but not limited to, excavation, grading, storm sewer system components, backfilling, asphalt pavement and patching, and all general conditions costs and overhead and profit associated with this work, shall be included in the amount of cost to Deduct from the Contract for this Alternate.

END OF SECTION 012300
SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes administrative and procedural requirements for substitutions.
   B. Related Section:
      1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

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

1.3 SUBMITTALS
   A. Substitution Requests: Submit copies according to Section 013300 Submittal Procedures for each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
      1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
         a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
         b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
         c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
         d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

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

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

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.
PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

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

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:
   a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   b. Requested substitution will not adversely affect Contractor's construction schedule.
   c. Requested substitution has received necessary approvals of authorities having jurisdiction.
   d. Requested substitution is compatible with other portions of the Work.
   e. Requested substitution has been coordinated with other portions of the Work.
   f. Requested substitution provides specified warranty.
   g. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500
SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 MINOR CHANGES IN THE WORK

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

1.3 PROPOSAL REQUESTS

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

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

2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

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

b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

c. Include costs of labor and supervision directly attributable to the change.

d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

e. Quotation Form: Use forms acceptable to Architect.
B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect. Requests for a change must be submitted within 21 days of the event, occurrence, action, or deficiency resulting in a need for a contract change.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.4 ADMINISTRATIVE CHANGE ORDERS

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

1.5 CHANGE ORDER PROCEDURES

A. On Owner’s approval of a Proposal Request, Contractor will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE


1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600
SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SCHEDULE OF VALUES

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

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

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

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

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

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

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

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

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

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

6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

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

1.3 APPLICATIONS FOR PAYMENT

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

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

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

C. Payment Application Times: Progress payments shall be submitted to Architect by the 15th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

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

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

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.

2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

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

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.

2. When an application shows completion of an item, submit conditional final or full waivers.

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

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

1. List of subcontractors.

2. Schedule of values.

3. Contractor's construction schedule (preliminary if not final).

4. Schedule of unit prices.

5. Submittal schedule (preliminary if not final).

6. List of Contractor's staff assignments.

7. List of Contractor's principal consultants.

10. Initial progress report.
12. Certificates of insurance and insurance policies.

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

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

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

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900
SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

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

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

B. Related Sections:

1. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

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

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

1.4 COORDINATION

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

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

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

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

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

1.5 COORDINATION DRAWINGS

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

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

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

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

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.

2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.

3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.

4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.

6. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility.

1.6 REQUESTS FOR INFORMATION (RFIs)

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

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.

2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

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

1. Project name.

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

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

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

1. The following RFIs will be returned without action:
   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or the Contract Sum.
   e. Requests for interpretation of Architect’s actions on submittals.
   f. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect’s action may include a request for additional information, in which case Architect’s time for response will date from time of receipt of additional information.

3. Architect’s action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section “Contract Modification Procedures.”
   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity (Contractor) responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
   a. Tentative construction schedule.
   b. Critical work sequencing and long-lead items.
c. Designation of key personnel and their duties.
d. Procedures for processing field decisions and Change Orders.
e. LEED for New Construction
f. Commissioning
g. Procedures for RFIs.
h. Procedures for testing and inspecting.
i. Procedures for processing Applications for Payment.
j. Distribution of the Contract Documents.
k. Submittal procedures.
l. Sustainable design requirements.
m. Preparation of record documents.
n. Use of the premises.
o. Work restrictions.
p. Working hours.
q. Owner's occupancy requirements.
r. Responsibility for temporary facilities and controls.
s. Procedures for moisture and mold control.
t. Procedures for disruptions and shutdowns.
u. Construction waste management and recycling.
v. Parking availability.
w. Office, work, and storage areas.
x. Equipment deliveries and priorities.
y. First aid.
z. Security.
aa. Progress cleaning.

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

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

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.

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

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

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings twice a month at equal intervals, at a time approved by Architect and Owner. The second meeting of each month will include review of the Contractors “Schedule of Values” and Monthly Pay Application.

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

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

   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind
schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

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

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

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

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100
SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

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

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

1.2 DEFINITIONS

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

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

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

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

D. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
1. PDF electronic file.
2. Two paper copies, of sufficient size to display entire period or schedule, as required.

B. Start-up Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

D. Daily Construction Reports: Submit at weekly intervals.

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

1.4 COORDINATION

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

B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

C. Coordinate with Division 01 Section “Indoor Air Quality Requirements” for documenting SMACNA measures.

PART 2 - PRODUCTS

2.1 CONTRACTOR’S CONSTRUCTION SCHEDULE, GENERAL

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
B. **Time Frame:** Extend schedule from date established for the Notice to Proceed to date of final completion.

   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. **Activities:** Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

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

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

   1. **Work under More Than One Contract:** Include a separate activity for each contract.
   2. **Work by Owner:** Include a separate activity for each portion of the Work performed by Owner.
   3. **Work Restrictions:** Show the effect of the following items on the schedule:

      a. Coordination with existing construction.
      b. Limitations of continued occupancies.
      c. Uninterruptible services.
      d. Partial occupancy before Substantial Completion.
      e. Use of premises restrictions.
      g. Seasonal variations.
      h. Environmental control.
4. Work Stages: Indicate important stages of construction for each major portion of the Work.

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

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

1. Unresolved issues.
2. Unanswered RFIs.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.

F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.

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

1. Utilize Microsoft Project, Primavera or Prolog for Windows XP or Windows Vista operating system.

2.2 CONTRACTOR’S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

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

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

C. CPM Schedule: Prepare Contractor’s construction schedule CPM network analysis diagram for the Work.

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

   a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect’s approval of the schedule.
2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

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

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the start-up network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
   a. Preparation and processing of submittals.
   b. Mobilization and demobilization.
   c. Purchase of materials.
   d. Delivery.
   e. Fabrication.
   f. Utility interruptions.
   g. Installation.
   h. Work by Owner that may affect or be affected by Contractor's activities.
   i. Testing and commissioning.
   j. Punch list and final completion.
   k. Activities occurring following final completion.

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

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

4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

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

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
5. Changes in the critical path.
6. Changes in total float or slack time.

2.3 REPORTS

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

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

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

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

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

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

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

END OF SECTION 013200
SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Construction RFI photographs
3. Post construction photographs.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.

1.2 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit unaltered, original, full-size image files within seven days of taking photographs.

1. Digital Camera: Minimum sensor resolution of 8 megapixels.
2. Identification: Provide the following information with each image description in file metadata tag:

   a. Name of Project.
   b. Name and contact information for photographer.
   c. Date photograph was taken.
   d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, with minimum size of 8 megapixels.
PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.
2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

C. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag corners of building and construction limits before taking construction photographs.
2. Take 40 photographs to show existing conditions adjacent to property before starting the Work.
3. Take 40 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.

D. Final Completion Construction Photographs: Take 30 color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

E. RFI Digital Photographs: Architect may request digital photographs to be submitted with RFI submission to clarify conditions in the field. The contractor shall maintain the digital camera on site, and provide digital photographs suitable for email transmission to the architect upon request.

END OF SECTION 013233
SECTION 013283
LEAD CONTROL PROCEDURES for INCIDENTAL LEAD PAINT DISTURBANCE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The BIDDING REQUIREMENTS, CONTRACTING REQUIREMENTS and CONDITIONS OF THE CONTRACT, and applicable parts of DIVISION 1 – GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

1.02 BASE BID SCOPE OF WORK

Lead-Based Paint (LBP) and/or Lead-Containing Paint (LCP) should be assumed to be present on all glazed and painted surfaces, and may be disturbed during renovations. Under the base bid for this work, the Contractor and Sub-Contractors will be required to comply with all federal, state, and local regulations regarding the incidental disturbance or removal of LBP/LCP as part of renovation activities, as required under 29 CFR 1926.62 and 40 CFR 745. All materials to be demolished and removed from the site shall become the property of the contractor. Disclosure/disposal requirements for all materials are the Contractor's responsibility.

LBP (as defined by Commonwealth of Virginia and US EPA) is known to be present on surfaces that will be impacted by the scheduled renovation. The following surfaces are listed below:
- Exterior Storage Room Metal Door Casings
- Ceramic Wall Tiles Located on Walls Planned for Demolition
- CMU Block Paint Located on Walls Planned for Demolition located in the Exterior Storage Room
- Exterior Bathroom Wood Door and Metal Door Casings

LCP is present on all other surfaces planned to be impacted by demolition.

Personnel disturbing or working on/impacting LBP materials shall have training in accordance with 40 CFR 745 (Renovation Repair, and Painting Rule - RRP). Any disturbance of paint shall follow work practices as defined under this standard. The Competent Person/Renovator as designated under the Standard shall oversee and be responsible for all work activities which may impact LBP in the building. As such under the base bid, the Contractor for this project shall be required to retain a United States Environmental Protection Agency (US EPA) Certified Renovator (as noted previously) to oversee/direct all activities where suspect LBP may be disturbed.

It is acceptable for one RRP certified firm to direct, oversee, and be responsible for all LBP disturbance activities (as defined under 40 CFR 745) for this project. Submit documentation of
compliance with this standard to the Owner prior to start of work, including an air-monitoring plan, dust control measures, training etc. (as applicable). All compliance sampling and other control measures for potential lead dust shall be addressed within exposure control and monitoring plan prepared by the Contractor (and subcontractors). This Plan must be approved by the Owner’s industrial hygienist prior to start of work. All compliance sampling is also the Contractor’s responsibility and shall be performed by individuals working under the direction of the Contractor’s Competent Person. All work will be performed by competent personnel who are appropriately trained, qualified, and knowledgeable in the techniques of abatement, handling, and disposal of LBP and materials contaminated by lead, in accordance with pertinent local, state, and federal regulations. Following completion of work, submit all monitoring documentation to the Owner. The Owner may elect to do independent sampling.

Under the base bid, the Contractor may be required to disturb, remove or repaint various painted surfaces and other painted components as specified for this project. The Contractor shall be required to contain the painted components (to be disturbed during renovation including demolition, repainting etc.) with a minimum of 6-mil poly on the interior/exterior of the building and to use drop cloths to prevent lead contamination to interior or exterior areas of the building following the requirements in the US RRP regulations. The contractor shall coordinate with Owner and the Architect to determine the best method to be used for re-painting components as required in this specification. General: The Contractor shall assume critical barriers will be erected between work areas and occupied areas. Depending on the scope item, the Contractor shall remove painted/glazed items without contamination to other areas of the building. The Contractor shall remove each component reasonably intact with minimal disturbance to the material be removed/impacted. After completion of each work activities in which LBP or LCP is disturbed or removed, the Contractor shall maintain and keep the areas clean and free from obvious paint chips and dust. The contractor shall continue cleaning and decontaminating areas of the building during the course of the project so as to maintain an environment free as reasonably possible for lead dust.

A. Limited dust wipe sampling may be conducted by the Owner’s Industrial Hygienist (IH) to verify the levels of lead in dust are below the US EPA/HUD clearance criteria. If a sample fails the contractor shall clean the entire building (or affected areas if it can be delineated) and the contractor shall continue cleaning and decontaminating at no cost to the owner until the building has passed acceptable US EPA/HUD clearance levels. All of the owner’s industrial hygienist and analytical fees caused by failed samples shall also be charged to the contractor.

B. As part of the base bid, the Contractor shall be required to remove and dispose of all lead containing and lead coated materials as part of renovation activities. All work shall comply with 29 CFR 1926.62. and 40 CFR 745. The work outlined in this Specification involves renovation activities of these building materials and steps needed to limit occupational and environmental exposure to lead hazards.

1.03 CODES AND REGULATIONS

A. General Applicability of Codes and Regulations, Guidelines and Standards: Except to the extent that more explicit or more stringent requirements are written directly into the contract documents, all applicable codes, regulations, guidelines and standards have the same force
and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith.

B. Contractor Responsibility: The Contractor shall assume full responsibility and liability for the compliance with all applicable Federal, State, and local regulations pertaining to work practices, protection of workers, visitors to the site, and persons occupying areas adjacent to the site and packaging, salvaging, and delivering lead-containing materials. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable Federal, State, and local regulations. The Contractor shall hold the Owner and Designers harmless for failure to comply with any applicable work, packaging, salvaging, delivering, safety, health or other regulation on the part of himself, his employees, or his subcontractors.

C. Federal Requirements: which govern lead based paint work or packaging, salvaging, and delivering of hazardous waste materials include but are not limited to the following:

1. OSHA: U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA), including but not limited to:

    - 29 CFR 1910.134 - Respiratory Protection;
    - 29 CFR 1926.103 - Respiratory Protection;
    - 29 CFR 1926.20 - General safety and health provisions;
    - 29 CFR 1926.21 - Safety training and education;
    - 29 CFR 1926.23 - First Aid;
    - 29 CFR 1926.24 - Fire Protection;
    - 29 CFR 1926.25 - Housekeeping;
    - 29 CFR 1926.28 - Personal protective equipment;
    - 29 CFR 1926.51(f) - Washing facilities;
    - 29 CFR 1926.55 - Gases, vapors, fumes, dusts, and mists;
    - 29 CFR 1926.56 - Illumination;
    - 29 CFR 1926.57 - Ventilation;
    - 29 CFR 1926.59 - Hazard Communication;
    - 29 CFR 1926.55 - Gases, Vapors, Fumes, Dusts, and Mists
    - 29 CFR 1926.62 - Lead Construction Standard;
    - 29 CFR 1926.200 - Accident Prevention Signs and Tags;
    - 29 CFR 1926.353 - Ventilation: Welding, cutting or heating of metals of toxic significance;
    - 29 CFR 1926.300, 301, 302 - Hand and power tools;
    - 29 CFR 1926.451 - Scaffolding;
    - 29 CFR 1926.500, 502, 503 - Fall Protection.
    - 29 CFR 1926 Subpart E - Personal Protective and Life Saving Equipment
2. DOT: U. S. Department of Transportation, including but not limited to:

49 CFR 171 and 172 - Hazardous Substances

3. EPA: U. S. Environmental Protection Agency (EPA), including but not limited to:

40 CFR 260, 261, - Resource Conservation and Recovery
262, 263 and 264 Act (RCRA)
40 CFR 745 RRP Rules - Lead Renovation, Repair and Painting (RRP) Program

D. State Requirements: Abide by applicable State requirements which govern packaging, salvaging, and disposal of hazardous waste materials.

E. Local Requirements: Abide by applicable local requirements which govern lead abatement work or packaging, salvaging, and disposal of hazardous waste materials.

F. Building Codes: Comply with applicable provision of State and/or local building codes that govern any part of the work.

1.04 DEFINITIONS

A. Accreditation: A formal recognition that an organization (e.g. laboratory) is competent to carry out specific tasks or type of tests.

B. Accredited Laboratory: A laboratory that has been evaluated and given approval to perform a specified measurement or task (such as the National Lead Laboratory Accreditation Program), usually for a specific property or analyze for a specified period of time.

C. Accredited Training Provider: A training provider that meets the standards established by EPA to train risk assessors, inspectors, supervisors, and workers.

D. Action Level: Employee exposure, without regard to use of respirators, to an airborne concentration of lead of thirty micrograms per cubic meter (30 µg/m³) of air averaged over an 8-hour period in an occupational/industrial environment. In a domicile or other environment where 24-hour exposure is possible, the action level is: exposure to an airborne time weighted average (24 hours) of concentration of lead of eight micrograms per cubic meter (8 µg/m³) of air.

E. Area Monitoring: Sampling for lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead concentrations that may reach the breathing zone of personnel potentially exposed to lead. The PM shall be responsible for all area monitoring.
F. **Blank**: A non-exposed sample of the medium used for testing, such as a wipe or filter, which is analyzed like other samples to determine whether (1) samples are contaminated with lead before samples are collected (e.g., at the factory, or at the testing site), (2) the samples are contaminated after sample collection (e.g., during transportation to the laboratory or in the laboratory).

G. **Breathing Zone**: A hemisphere forward of the shoulders with a radius of approximately 6 to 9 inches around the nose and mouth of the face.

H. **Building Component**: Any part of a building coated with paint.

I. **Ceiling Concentration**: The concentration of an airborne substance that shall not be exceeded.

J. **CFR - The Code of Federal Regulations**: The basic component of the Federal Register publication system. The CFR is a codification of the regulations of the various Federal Agencies.

K. **Detection Limit**: The minimum of a component that a method can reliably measure.

L. **Eight-Hour Time Weighted Average (TWA)**: Airborne concentration of lead to which an employee is exposed, averaged over an 8-hour workday as indicated in 29 CFR 1926.62.

M. **Engineering Controls**: Measures other than respiratory protection or administrative control that are implemented at the work site to contain, control, and/or otherwise reduce exposure to lead-contaminated dust and debris. The measures include process and product substitution, isolation, and ventilation.

N. **Exposure Monitoring**: The personal air monitoring of an employee’s breathing zone to determine the amount of contaminant (e.g. lead) to which he/she is exposed.

O. **Federal Register**: A document published daily by the Federal government that contains either proposed or final regulations.

P. **Hazardous Waste**: As defined in RCRA the term "hazardous waste" means a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

1. Cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or

2. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

3. As defined in the regulations, a solid waste is hazardous if it meets one of four conditions:
a. Exhibits a characteristic of a hazardous waste (40 CFR Sections 261.20 through 262.24).

b. Has been listed as hazardous (40 CFR Section 261.31 through 261.33).

c. Is a mixture containing a listed hazardous waste and a non-hazardous solid waste (unless the mixture is specifically excluded or no longer exhibits any of the characteristics of hazardous waste).

d. Is not excluded from regulation as a hazardous waste.

Q. HEPA - High Efficiency Particulate Air: A filter capable of filtering out particles of 0.3 microns or greater from a body of air at 99.97% efficiency or greater.

R. Landfill: A disposal facility or part of a facility where hazardous waste is placed in or on land and which is not a land treatment facility, a surface impoundment, or an injection well.

S. Lead Based Paint (LBP): Protective or decorative coating which contains lead in quantities greater than EPA allowable concentrations.

T. µg - Micrograms: The prefix “micro-” means “1/1,000,000 of” (one millionth of). A microgram is 1/1,000,000 of a gram and 1/1,000 of a milligram. A microgram is equal to about 35/1,000,000,000 (thirty-five billionths) of an ounce. 28,400,000 µg is equal to 1 ounce.

U. Permissible Exposure Limit (PEL): Fifty micrograms per cubic meter (50 µg/m³) of air as an 8-hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more than 8 hours in a work day, the PEL shall be determined by the following formula: PEL (micrograms/cubic meter of air) = 400/Number of hours worked per day.

V. Personal Monitoring: Sampling of the lead dust concentrations within the breathing zone of an employee.

W. Personal Samples (for sampling lead dust): Air samples collected from within the breathing zone of a worker, but outside the respirator. The samples are collected with a personal sampling pump, pulling 1 to 4 liters/minute of air.

X. Solid Waste: As defined in RCRA the term "solid waste" means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under the Clean Water Act, or special nuclear or byproduct material as defined by the Atomic Energy Act of 1954.
Y. TCLP (Toxicity Characteristic Leaching Procedure): A test, called the extraction procedure that is designed to identify wastes likely to leach hazardous concentrations of particular toxic constituents into the ground water as a result of improper management. It is a characteristic of hazardous waste.

1.05 WORKER PROTECTION

All workers are to be notified of the presence of components painted and glazed with lead-based and lead-containing products. Workers shall comply with 29 CFR 1926.62 for all personal protective equipment (PPE) and the US EPA Renovation, Repair and Painting (RRP) Program.

1.06 SUBMITTALS

A. Before the start of work, submit the following to the Owner’s Representative for review. Do not begin work until these submittals are returned with the Owner’s Representative’s action stamp indicating that the submittals are returned for unrestricted use.

1. Certifications: Submit the Contractor supervisor and workers training certifications under the US EPA Renovation, Repair and Painting (RRP) Program.

2. Testing Laboratory Qualifications:
   a. Submit the name, address, and telephone number of the testing laboratory selected to perform the Toxicity Characteristic Leaching Procedure (TCLP) testing and the analysis for lead content in the air to evaluate personal exposure. The laboratory shall be accredited by the American Industrial Hygiene Association (AIHA). Provide AIHA documentation along with date of accreditation/reaccreditation.

3. Hazardous Waste Management:
   a. Submit a Hazardous Waste Management Plan within 14 days after award of contract to the Owner’s Representative for approval. The Hazardous Waste Management plan shall comply with applicable requirements of Federal, State, and local hazardous waste regulations and address:
      i. Procedures to segregate wastes into separate waste streams to minimize the quantity of hazards waste generated.
      ii. Testing to identify hazardous wastes associated with the work.
      iii. Estimated quantities of wastes to be generated and disposed of.
      iv. Transporter / disposal facility documentation including, name, location, EPA identification number, hazardous waste permits and a 24 hour point of contact.
      v. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.
      vi. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.

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vii. Spill prevention, containment, and cleanup contingency measures to be implemented.

viii. Procedures and schedule for waste containment, control and disposal wastes shall be cleaned up and containerized daily.

4. Manufacturer's Catalog Data:
   a. HEPA Vacuums.
   b. Respirators.
   c. HEPA filtered negative air machines.
   d. LBP Control Chemicals.
   e. All other tools or equipment that the contractor plans on using to remove Lead-Containing materials.
   f. Instructions: Paint control materials. Include applicable safety data sheets.

5. RRP Compliance Plan and Certification: Ten (10) days before work starts, submit to the Owner’s Representative for approval a detailed job-specific plan of work procedures to be used in the control and/or removal of lead-based materials. The Plan shall include the name of the Renovator assigned to supervise the operation, a sketch showing the location, size, and details of lead control areas, type of containment materials used, location and details of decontamination rooms, change rooms, shower facilities, and HEPA filtered mechanical ventilation system.
   a. Include in the Plan: eating, drinking, smoking and restroom procedures, interface of trades, sequencing of lead related work, collected wastewater and lead paint and/or lead containing material debris disposal plan, air sampling plan, respirators, protective equipment, and a detailed description of the method of containment of the operation to ensure that airborne lead concentrations of 30 micrograms per cubic meter of air are not exceeded outside of the lead control area.
   b. Include air sampling, strategy, sampling methodology, frequency, duration of sampling, and qualifications and training of air monitoring personnel in the sampling portion on the Plan.

B. During the Work: TCLP test results, as required to characterize waste for segregation and packaging purposes.

1. Records: Submit completed and signed hazardous waste manifest from treatment or disposal facility, if applicable.

PART 3 EXECUTION

3.01 PROTECTION

A. Notification: Prior to the renovation of the structure, all workers are to be notified that components in the building being disturbed during the renovation activities may contain lead and have received adequate training under 29 CFR 1926.62.
B. Lead Work Area Requirements: Establish a Lead Work Area as needed by demarcating with a minimum of 4" barrier tape and placing 6 mil (0.15 mm) in thickness polyethylene sheeting on surfaces where lead-containing building materials will be disturbed.

C. Protection of Existing Work to Remain: Perform renovation activities involving the disturbance of lead-containing building materials without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, the Contractor will restore it to its original condition.

D. Boundary Requirements: Provide physical boundaries around the Lead Work Area by sealing off the area, if determined necessary, and as designated on the approved work plan to ensure that airborne concentrations of lead will not reach thirty micrograms per cubic meter (30 µg/m³) of air outside of the Lead Work Area.

E. Heating, Ventilating and Air Conditioning (HVAC) Systems: Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead work areas. Seal intake and exhaust vents inside the lead work area with 6 mil (0.15 mm) in thickness polyethylene sheeting and tape. Seal seams in HVAC components that pass through the Lead Work Area as needed.

F. Change Room and Shower Facilities: Provide clean change rooms and shower facilities in accordance with requirements of 29 CFR 1926.62 as needed.

G. Mechanical Ventilation System (if deemed necessary through the lead control work plan):

1. Use adequate ventilation to control personnel exposure to lead in accordance with 29 CFR 1926.62. Shut down and protect ventilation systems in work areas to prevent contamination to the systems.

2. Contain removal operations by the use of a negative pressure containment system with at least one change room and with HEPA filtered exhaust, exhausted to the outside of the building. The negative pressure containment shall have a minimum of 4 air changes per hour. The Contractor shall maintain a -0.020 column inches of water pressure differential, relative to outside pressure. This measurement shall be recorded and maintained within the enclosure as evidenced by manometric measurements and maintained around the clock, or until authorization for containment control is obtained from the Owner’s Representative. Hourly readings shall be recorded while renovation work involving the disturbance of lead-containing building materials is being performed. Anytime the negative pressure is less than -0.020 column inches of water pressure differential, relative to outside pressure, all renovation work inside the containment will stop. The work may be restarted only after the negative pressure is restored to a level of -0.020 column inches of water pressure differential or greater, relative to outside pressure.
H. **Personnel Protection:** Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking is not permitted in the Lead Work Area. The Contractor shall provide the appropriate type of respirator to be used by the employees as required by 29 CFR 1926.62.

I. **Warning Signs:** Provide warning signs at approaches to Lead Work Areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62.

### 3.02 WORK PROCEDURES

A. The assigned Competent Person shall supervise the renovation work and will be on site anytime work is on-going. This person shall use procedures and equipment required to limit occupational and environmental exposure to lead during renovation activities in accordance with 29 CFR 1926.62, except as specified herein. Dispose of lead-containing materials, any paint chips and associated waste in compliance with applicable Federal, State, and local requirements.

B. **Personnel Hygiene:** Whenever personnel exit the Lead Work Area, workers shall perform the following procedures and shall not leave the work until:

1. HEPA vacuum themselves off;

2. Remove protective clothing, and place them in an approved impermeable disposal bag;

3. Change to clean clothes prior to leaving the Lead Work Area.

C. **Monitoring:** The Owner may contract an Industrial Hygiene Consultant (IHC) to provide on-site project monitoring and testing.

1. The IHC shall not have any direct or indirect association with the General Contractor (GC) or the Contractor.

2. Monitoring of airborne concentrations of lead (if conducted), will be in accordance with 29 CFR 1926.62 and as specified herein.

D. **Monitoring during the Lead Work:**

1. As determined by the competent person for the Contractor, area monitoring shall be performed during the Lead Work. Sufficient area monitoring shall be conducted at the physical boundary outside the Lead Work Area to ensure unprotected personnel are not exposed above thirty micrograms per cubic meter (30 µg/m³) of air.

   a. If the outside boundary lead levels are at or exceed 30 µg/m³ of air, work shall be stopped and the Contractor shall notify the Owner immediately.
i. The Owner’s IHC shall immediately investigate, perform necessary air and/or wipe sampling and render a decision as whether these areas are contaminated. The findings of the investigation and the results of any samples taken shall be reported to the Owner immediately.

ii. If the area investigated by the IHC is found to be contaminated with lead, the following procedures shall be followed:
   a) Work in the Lead Work Areas shall remain halted.
   b) The Contractor shall decontaminate (clean up) the contaminated area at no cost to the Owner.
   c) The IHC shall determine the source and cause of the contamination, along with the necessary corrective measures to be taken.
   d) The Contractor shall decontaminate the contaminated area using the corrective measures outlined by the IHC.
   e) The IHC shall visually inspect the “contractor cleaned” contaminated area and perform floor, window sill, window well, rough exterior surfaces, and/or bare soil wipe or sample tests. The number of applicable tests will be determined by the IHC. Results of the applicable tests shall be less than forty micrograms per square feet (<40 µg/ft²) for floor wipe test, two hundred and fifty micrograms per square feet (<250 µg/ft²) for window sill wipe test, four hundred micrograms per square feet (<400 µg/ft²) for window sill wipe test, eight hundred micrograms per square feet (≤800 µg/ft²) for rough exterior surface wipe test, and/or four hundred parts per million (<400 ppm) for bare soil sample test. The IHC shall submit copies of all sample results along with a certification that the area is no longer contaminated with lead.
   f) If on the second try, the contractor is unable to achieve a wipe sample result of less than the above referenced values for a particular area, the following procedures shall be followed:
      1. The IHC shall render a decision as to what clearance level would be achievable for that particular area.
      2. The IHC shall submit to the Owner this decision, along with copies of the sampling data for area, along with a certification that the area is no longer contaminated with lead.
   g) The Owner will issue the authority to restart work in the Lead Work Area, once the IHC reports to the Owner, that the contaminated area has been successfully decontaminated.

2. The IHC shall review the sampling data collected to determine if condition(s) requires any further change in work methods. The Lead Work shall resume when approval is given by the Owner.

E. Final Clearance Dust Wipe Testing (see also Section 3.3)

1. The IHC shall perform dust wipe testing by using methodology that is outlined in HUD’s Guidelines for the Evaluation and Control of Lead-Based Paint hazards in Housing. Each Lead Work Area is considered complete, if all dust wipe sample results are below:
   a. 40 micrograms per square feet (40 µg/ft²) on floors;
   b. 250 micrograms per square feet (250 µg/ft²) on interior window sills;
   c. 400 micrograms per square feet (400 µg/ft²) on window wells or troughs;
   d. 800 micrograms per square feet (800 µg/ft²) on rough exterior surfaces;
   e. 400 parts per million (400 ppm) on bare soil.
2. The Contractor shall be responsible for re-cleaning of the Lead Work Area(s), following the analysis of final clearance wipe samples resulting in unacceptable concentrations of lead at no additional cost to the Owner.

3. The Contractor shall be responsible for any additional cost due to the Owner for the re-collection of final clearance wipe samples due to unacceptable initial results including re-cleaning, sample analysis and sample collection fees.

4. At the end of the project but before re-occupancy, sampling will be performed in each area to includes floor and walls.

F. OSHA Monitoring: OSHA Monitoring is work of the Contractor and is not covered in this section. However, it must be conducted daily as required and in accordance with 29 CFR 1926.1101.

3.04 DETERMINATION OF HAZARDOUS WASTE MATERIALS

A. Testing of waste by Toxicity Characteristic Leaching Procedure (TCLP) will be performed by the Owner’s Representative. Sampling of waste products shall be conducted in a representative manner in accordance with EPA Document SW 846 and analyzed performed in accordance with EPA Method 1311. Samples will be collected from each waste category. Results will be supplied to the Contractor.

B. Waste tested which results in a lead content in the leachate of greater than or equal to five parts per million (5 ppm) is to be considered hazardous, handled and disposed of according to local, city, State, and federal regulations. Waste tested which results in a lead content in the leachate of less than 5 ppm can be disposed of as regular construction waste. In no manner may the components that contain lead-based paint (LBP) shall be recycled and re-deposited on site.

3.05 DISPOSAL

A. Collect all potential lead-contaminated waste, including but not limited to, removed paint chips, architectural components, scrap, debris, bags, containers, equipment, and lead-contaminated clothing. Title to all waste including lead waste shall be the Contractors responsibility for removal and disposal under the base bid scope of work.

B. For drummed waste, store in U.S. Department of Transportation (49 CFR 178) approved 55 gallon drums to identify the type of waste (49 CFR 172) and the date lead contaminated wastes were first put into the drum. For architectural components, e.g., doors, windows, and molding, store so as to prevent environmental contamination. 6-mil plastic sheeting should be placed underneath and on top of the material; plywood or other durable material should be placed on top of the plastic to prevent it from being punctured. Transport waste in covered vehicle only.
C. Periodically remove hazardous wastes, so that 90 calendar day storage limitations are not exceeded.


E. Disposal Documentation: Submit written evidence that the hazardous waste transporter and the treatment, storage, or disposal facility (TSDF) is approved for lead disposal by the EPA and State or local regulatory agencies. Submit one copy of the completed manifest, signed and dated by the initial transporter in accordance with 40 CFR 262. Submit Certification of disposal from TSDF.

END OF SECTION
SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Sections:
   1. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
   2. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
   3. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
   4. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

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

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


1.3 ACTION SUBMITTALS

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

1.5 CAD FILES: The Architect's Digital Data Files: One Electronic copy of the Architectural CAD Drawings of the Contract Drawings may be provided upon official request by the awarded Contractor for use in preparing submittals. CAD files will only be released in the original CAD file format. Requests for modifications to the CAD file format, i.e. (saving them down to a previous version of AutoCad), will not be granted. Release of CAD files will only be granted after the Contractor reviews and returns a signed CAD File release agreement form provided by the Architect, and agrees to all conditions of use as indicated in the CAD Files release agreement form.

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

1. Provide one complete coordinated submittal for each individual Specification Section. Multiple-part sections of a Specification Section submitted separately will not be reviewed and will be returned Rejected as incomplete, and will be counted as one submittal review.

2. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

3. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

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

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

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

3. The Architect will review up to one initial submittal and one resubmittal of each required submittal. If more than two reviews of a submittal are required as a result of incomplete or inaccurate submittals by the Contractor, then the time required by the Architect to review subsequent submittals will be paid for by the Contractor. Adjustments in the Contractor's Contract Sum will be made by Change Order to compensate the Architect for additional submittal review time.
C. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:
   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Contractor.
   e. Name of subcontractor.
   f. Name of supplier.
   g. Name of manufacturer.
   h. Submittal number or other unique identifier, including revision identifier.

   1) Submittal number shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., CHPS-NES-166006.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., CHPS-NES-166006.01.A).

   i. Number and title of appropriate Specification Section.
   j. Drawing number and detail references, as appropriate.
   k. Location(s) where product is to be installed, as appropriate.
   l. Other necessary identification.

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

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., CHPS-NES-166006.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., CHPS-NES-166006.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Include the following information on an inserted cover sheet:
a. Project name.
b. Date.
c. Name and address of Architect.
d. Name of Contractor.
e. Name of firm or entity that prepared submittal.
f. Name of subcontractor.
g. Name of supplier.
h. Name of manufacturer.
i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Location(s) where product is to be installed, as appropriate.
l. Related physical samples submitted directly.
m. Other necessary identification.

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

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

G. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

H. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.

1. Transmittal Form: Use AIA Document G810 or approved equal.
2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
3. Submittals which have not been reviewed by the Contractor, which have incomplete information, or which have unmarked information which clearly deviates from the Construction Documents will be returned without action. The Contractor must review, coordinate, and markup submittals before delivering them to the Architect.

I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

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

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

2.2 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit one PDF electronic file and one paper copy for each submittal including product data, shop drawings, certifications, that is, all submittals except shop drawings.

2. Action Submittals: Submit one PDF electronic file and one paper copy of each submittal, unless otherwise indicated.

3. Informational Submittals: Submit one PDF electronic file and one paper copy of each submittal, unless otherwise indicated. Architect will not return copies.

4. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
   b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

6. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

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

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

5. Submit Product Data before or concurrent with Samples.

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

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 42 inches (750 by 1067 mm).

3. Submit Shop Drawings in the following format:

   a. Submit one electronic PDF file and one opaque (bond) copies of each submittal. Architect will return annotated electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

   1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

   2. Identification: Attach label on unexposed side of Samples that includes the following:

      a. Generic description of Sample.
      b. Product name and name of manufacturer.
      c. Sample source.
      d. Number and title of applicable Specification Section.

   3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

      a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
      b. Samples not incorporated into the Work, or otherwise designated as Owner’s property, are the property of Contractor.

   4. Samples for Initial Selection: Submit manufacturer’s color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

      a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer’s product line. Architect will return submittal with options selected.

   5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or
containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project record sample.

1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

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

G. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

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

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

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


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

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

O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

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

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

S. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

T. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

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

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

W. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

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

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

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

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

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

PART 3 - EXECUTION

3.1 CONTRACTOR’S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect. Incomplete submittals, submittals without Contractor review comments, or submittals without the Contractor’s approval stamp will be returned without action by the architect.

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

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

3.2 ARCHITECT’S ACTION

A. General: Architect will not review submittals that do not bear Contractor’s approval stamp and will return them without action.
1. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

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

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

D. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300
SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

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

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

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

C. Related Sections:

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

1.2 DEFINITIONS

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

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

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

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

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

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

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

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

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

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

1.3 CONFLICTING REQUIREMENTS

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

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

1.4 INFORMATIONAL SUBMITTALS

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

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

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

1.5 REPORTS AND DOCUMENTS

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

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

B. Manufacturer’s Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

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

1.6 QUALITY ASSURANCE

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

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

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

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

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

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

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

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

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

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

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

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

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

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

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

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

1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

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

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


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

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

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

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.8 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections attached to this Section, and as follows:

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

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

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

B. Protect construction exposed by or for quality-control service activities.
C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000
SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. “Approved”: When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. “Directed”: A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. “Indicated”: Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract
Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale’s "Encyclopedia of Associations" or in Columbia Books’ "National Trade & Professional Associations of the United States."

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

IAPMO International Association of Plumbing and Mechanical Officials

ICC International Code Council

ICC-ES ICC Evaluation Service, Inc.

UBC Uniform Building Code
(See ICC)

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE Army Corps of Engineers

CPSC Consumer Product Safety Commission

DOC Department of Commerce
DOD  Department of Defense
DOE  Department of Energy
EPA  Environmental Protection Agency
FAA  Federal Aviation Administration
FCC  Federal Communications Commission
FDA  Food and Drug Administration
GSA  General Services Administration
HUD  Department of Housing and Urban Development
LBL  Lawrence Berkeley National Laboratory
NCHR  National Cooperative Highway Research Program
       (See TRB)
NIST  National Institute of Standards and Technology
OSHA  Occupational Safety & Health Administration
PBS  Public Buildings Service
       (See GSA)
PHS  Office of Public Health and Science
RUS  Rural Utilities Service
       (See USDA)
SD  State Department
TRB  Transportation Research Board
USDA  Department of Agriculture
USPS  Postal Service

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.
ADAAG  Americans with Disabilities Act (ADA)  
Architectural Barriers Act (ABA)  
Accessibility Guidelines for Buildings and Facilities  
Available from U.S. Access Board

CFR  Code of Federal Regulations  
Available from Government Printing Office

DOD  Department of Defense Military Specifications and Standards  
Available from Department of Defense Single Stock Point

DSCC  Defense Supply Center Columbus  
(See FS)

FED-STD  Federal Standard  
(See FS)

FS  Federal Specification  
Available from Department of Defense Single Stock Point

Available from Defense Standardization Program

Available from General Services Administration

Available from National Institute of Building Sciences

FTMS  Federal Test Method Standard  
(See FS)

GBCI  Green Building Certification Institute: 2101 L Street NW, Suite 650,  
Washington DC 20037; 1-800-795-1746 (reference for all LEED related standards)

MIL  (See MILSPEC)

MIL-STD  (See MILSPEC)

MILSPEC  Military Specification and Standards  
Available from Department of Defense Single Stock Point

UFAS  Uniform Federal Accessibility Standards  
Available from Access Board
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200
SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1  SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Section:

1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.

1.2  USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Water Service: Water is available on site, and the contractor may use owner's water source provided use is not abused or misused.

1.3  INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1.4  QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board’s ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner’s acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect and construction personnel office activities and to accommodate project meetings specified in other Division 01 Sections. Keep office clean and orderly.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Use of any HVAC system, permanent or temporary, in the building is prohibited unless authorized by the Owner. Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section “Closeout Procedures.”

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."

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

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service.

1. Arrange with utility company, Owner and users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Is available.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Coordinate with the electrical power provider for permanent electrical service.
2. Connect temporary power as directed by local utility company.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

I. Telephone Service: Provide superintendent with cellular telephone or portable two-way radio.

J. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access project electronic documents and maintain electronic communications.

K. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these 3 functions.

1. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 384 Kbps upload and 1 Mbps download speeds at each computer.
2. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing and spam protection in a combined application.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.

2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."
5. Repair all existing asphalt damaged during construction following the specifications for new asphalt paving.

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.
3. The contractor shall not block or hinder vehicular access to the site at any time.

E. Parking: Provide temporary parking areas for construction personnel.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide a project identification sign not less than 4’x8’ printed in full color on exterior weather resistant sign board with images and artwork provided by the architect. (to be paid for and installed by the Contractor with the following requirements):
   a. Minimum Size: 4’x8’
   b. Material: exterior marine grade 3/4” plywood with fully color printed text and image graphics.
   c. Mounting: (2) painted pressure treated 4x4 embedded posts or on posts mounted on pressure treated 36” long “skids” for stability, with 1/2” galvanized carriage bolt hardware.

2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
   a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touchup signs so they are legible at all times.

H. Waste Disposal Facilities:
1. Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings.

C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering the construction area except by entrance gates.

1. Extent of Fence: Limits within the construction area as required to enclose and secure work areas, staging areas, and areas encumbered by the contractor for construction operations. Contractor shall prepare a plan showing location of site enclosure fence for review and approval by Owner.

2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

I. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide fire rated enclosures as required.

J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

K. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
2. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
3. Protect air-handling equipment.
4. Provide walk-off mats at each entrance through temporary partition.

L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
   1. Prohibit smoking in construction areas.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
   4. Provide temporary standpipes and hoses for fire protection as required by authority having jurisdiction. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

A. Contractor’s Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
   1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
   2. Keep interior spaces reasonably clean and protected from water damage.
   3. Discard or replace water-damaged and wet material.
   4. Discard, replace or clean stored or installed material that begins to grow mold.
5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000
SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Section:

1. Division 01 Section "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product;" including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
1.3 ACTION SUBMITTALS

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

1. Architect’s Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

   a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
   b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer’s written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer’s original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."
PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
   a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered, unless otherwise indicated.
   b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers:
a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered, unless otherwise indicated.

b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", or match other project materials, provide a product that complies with requirements and matches Architect's sample or other designated materials. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

2. For painted or stained surfaces, custom colors may be required in order to match architect's sample. Contractor will provide custom colors as required at no additional cost.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000
SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

B. Related Sections:

1. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
2. Division 07 Section "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 INFORMATIONAL SUBMITTALS

A. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.

1.3 QUALITY ASSURANCE

A. 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 land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions
from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect’s opinion, reduce the building’s aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.4 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of
underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

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

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."
3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

D. Final Property Survey: Engage a land surveyor or professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official “property survey.”

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer’s written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.
3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.
END OF SECTION 017300
SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Sections:

1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
2. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
4. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

8. Complete startup testing of systems.


10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

11. Advise Owner of changeover in heat and other utilities.

12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

13. Complete final cleaning requirements, including touchup painting.

14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for final completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."

2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Submit pest-control final inspection report and warranty.

5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify
Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding to interior spaces.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Submit list of incomplete items in the following format:
   a. Electronic PDF format and three paper copies, unless otherwise indicated.

1.5 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
C. Provide additional copies of each warranty to include in operation and maintenance manuals.

D. All warranty periods are to begin no sooner that the date of Substantial Completion. The Contractor shall obtain at his expense an extension of warranties for products or equipment that are delivered, installed, or operated prior to the date of Substantial Completion.

E. Requirement for coordinating with Division 01 Section “Sustainable Design Requirements-LEED” for LEED submittal requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Remove snow and ice to provide safe access to building.

f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

h. Sweep concrete floors broom clean in unoccupied spaces.

i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

k. Remove labels that are not permanent.

l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

n. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

r. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
END OF SECTION 017700
SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Sections:

1. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

A. Format: Submit operations and maintenance manuals in the following format:

   a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.
   b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

B. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or modify each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.
7. Name and contact information for Commissioning Agent.
8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
9. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based upon file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment.
names in a readily navigated file tree. Configure electronic manual to display bookmark panel upon opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.

4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
2. Flood.
5. Power failure.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers’ maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual’s table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers’ Maintenance Documentation: Manufacturers’ maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules
for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823
1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections:

1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
2. Divisions 02 through 49 Sections for specific requirements for project record documents of the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of record Drawings as follows:

   a. Initial Submittal: Submit one paper copy set of marked-up record prints. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

   b. Final Submittal: Submit five (3) paper copy sets of marked-up record prints. Print each Drawing, whether or not changes and additional information were recorded. Submit one (1) PDF electronic file of scanned record prints.

B. Record Specifications: Submit five (3) paper copy of Project's Specifications, including addenda and contract modifications. Submit one (1) PDF electronic file of scanned record prints.

C. Record Product Data: Submit one paper copy and directories of each submittal. Submit one (1) PDF electronic file of scanned or electronic record prints.
PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Record data as soon as possible after obtaining it.
   c. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.

3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Architect.
   e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as paper copy.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as paper copy.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready forcontinued use and reference.

B. Format: Submit miscellaneous record submittals as paper copy.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.
B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect’s reference during normal working hours.

END OF SECTION 017839
SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules utilizing manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

1.3 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

B. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.
PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.

2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project record documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.

5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.

7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.

8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.
PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Demonstration – General
   a. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of the section, unless approved in advance by Owner.
   b. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.
   c. Demonstration may be combined with Owner personnel training if applicable.
   d. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventative maintenance.
      1) Perform demonstrations not less than two weeks prior to Substantial Completion.
      2) For equipment and systems requiring seasonal operation, perform demonstration for other season within six month.
   e. Non-Operating Products: Demonstrate cleaning, scheduled and preventative maintenance, and repair procedures.
      1) Perform demonstrations not less than two weeks prior to Substantial Completion.

2. Training – General
   a. Conduct training on-site unless otherwise indicated.
   b. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Owner.
   c. Provide training in minimum two hour segments.
   d. Training schedule will be subject to the availability of Owner’s personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner, failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel “show-up” time.
   e. Review of Facility Policy on Operation and maintenance Data: During training discuss:
1) The location of the O&M manuals and procedures for use and preservation; backup copies.
2) Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
3) Typical uses of the O&M manuals.
f. Product and System Specific Training:
   1) Review the applicable O&M manuals.
   2) For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3) Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4) Provide hands-on training on all operational modes possible and preventative maintenance.
   5) Emphasize safe proper operational requirements; discuss relevant health and safety issues and emergency procedures.
   6) Discuss common troubleshooting problems and solutions. Discuss any peculiarities of equipment installation or operation.
   7) Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   8) Review recommended tools and spare parts inventory suggestions of manufacturers.
   9) Review spare parts and tools required to be furnished by Contractor.
  10) Review Spare parts suppliers and sources and procurement procedures.
  g. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three working days.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner with at least seven days' advance notice.

C. Evaluation: At conclusion of each training module, assess and document each participant’s mastery of module by use of an oral performance-based test.

END OF SECTION 017900
SECTION 02080
ENGINEERING CONTROLS FOR ASBESTOS CONTAINING MATERIALS

PART 1 – GENERAL

1.1 NOTES FOR DEMOLITION

A. The Abatement Contractor shall coordinate with the School System to ensure that all appropriate systems that will be impacted by renovation/demolition have been properly decommissioned prior to the start of any work.

1.2 WORK INCLUDED

A. The work includes the furnishing of all labor, materials, equipment, insurance, and services necessary for and reasonably incidental to the completion of asbestos removal and related work.

B. Comply with all governing regulations, which the specifications supplement.

C. Comply with DIVISION 1 GENERAL REQUIREMENT.

D. All other work as herein specified. The Abatement Contractor will be responsible for obtaining any local, state, and federal permits, as appropriate for this project, prior to starting work. All permits, notifications, patent restrictions or requirements, whether specified in these specifications or not, are the sole responsibility of the Abatement Contractor performing the work described in these specifications. Note: If during the course of the contract, the Abatement Contractor is found not to be in compliance with the
project specifications, the Abatement Contractor will stop all work until all deficiencies related to the Abatement Contractor's performance are corrected. Standby time required to resolve any violations caused by the Abatement Contractor shall be at the Abatement Contractor's expense. Likewise the Contractor will pay for any project delay that his violation causes the Building Owner. The Abatement Contractor will also be back-charged by the Building Owner for any additional IH/project monitor site visits and/or additional analytical and sample collection fees resulting from poor work practices during removal including failed final/clearance air samples.

1.3 REGULATIONS

A. All work shall conform to the requirements of the U. S. Environmental Protection Agency (EPA), U. S. Department of Labor - Occupational Safety and Health Administration (OSHA) and applicable State regulations relating to asbestos.

B. The EPA and OSHA regulations shall be posted at the job site for the duration of the work; posting shall be in a location clearly visible to employees and others in the area.

1.4 DEFINITIONS

A. Accredited/Accreditation: When referring to a person, Contractor or laboratory, means that such person is accredited in accordance with Section 206 of Title II of the Toxic Substances Control Act (AHERA Regulations).

B. Aerosol: A system consisting of particles, solid or liquid, suspended in air.

C. Aggressive Sampling: High-activity level air sampling which results in all settled asbestos remaining airborne and uniformly disturbed through the use of special entrainment and mixing techniques. This makes any settled asbestos fibers accessible to the sampling filters for subsequent detection. The technique is described in 40 C.F.R. 763.90, Appendix A to Subpart E; and Guidance for Controlling ACM in Buildings, Appendix M.

D. Air Filtration Device (AFD): Air filtration device (AFD) is part of the pressure differential system in which the air is filtered. The AFD is to be equipped with HEPA filters.
E. Air Monitoring: The process of measuring the fiber content of a specific volume of air. NIOSH Method 7400 or TEM Method in 40 C.F.R. 763, Subpart E, Appendix A, will be used for sampling and analysis.

F. Amended Water: Water to which a surfactant has been added.

G. Approve: Where used in conjunction with the QP's response to submittals, requests, applications, inquiries, reports, and claims by the Contractor, "approved" will be held to limitations of QP’s responsibilities and duties and does not release the Contractor from responsibilities to fulfill requirements of the Contract Documents. Approved shall also mean consent by U.S. EPA of training programs and the like.

H. Asbestos: The asbestiform varieties of serpentine (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite (amosite), anthophyllite, and actinolite-tremolite. Both the asbestiform and non-asbestiform varieties of the above minerals and any of these materials that have been chemically treated and/or altered shall be considered to be asbestos.

I. Asbestos-Containing Material (ACM): Any material containing more than 1% by weight of asbestos of any type or mixture of types.

J. Asbestos-Containing Waste Material: Any material, which is or is suspected of being or any material contaminated with an asbestos-containing material, which is to be removed from a Work Area for disposal.

K. Authorized Visitor: Personnel authorized by the Project Officer, testing lab personnel, or a representative of any Federal, State or local regulatory agency having authority over the project are considered authorized visitors.

L. Barrier: Any surface that seals off the Work Area to inhibit the movement of fibers.

M. Breathing Zone: A hemisphere forward of the shoulders with a radius of approximately 6 to 9 inches.
N. Ceiling Concentration: The concentration of an airborne substance that shall not be exceeded.

O. Certified Industrial Hygienist (C.I.H.): An industrial hygienist certified in Comprehensive Practice by the American Board of Industrial Hygiene.

P. Critical Barrier: Two layers of 6 mil polyethylene sheeting on wall or three layers on floor - spray foam, or duct tape used to completely seal off the Work Area to prevent spread of fibers to surrounding areas.

Q. Decontamination (Decon) Area: An enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower room and a clean room which is used for the decontamination of workers, materials and certain equipment contaminated with asbestos. This shall serve as the only entrance or exit to the Work Area.

R. Demolition: The wrecking or taking out of any building component, system, finish or assembly of a facility together with any related handling operations.

S. Disposal Bag: A 6-mil thick, leak-proof polyethylene bag used for transporting asbestos waste from the work area to the disposal site. Each is labeled in compliance with OSHA 1926.1101 as follows:

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DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
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U.S. DOT ORM-E label for Asbestos-Hazardous Material (including Asbestos Waste Manifest) and statements as required.

T. Encapsulant: A material that surrounds or embeds asbestos fibers in an adhesive matrix to prevent release of fibers.

U. Bridging Encapsulant: An encapsulant that forms a discrete layer on the surface of an in situ asbestos matrix.

V. Penetrating Encapsulant: An encapsulant that is absorbed by the in situ asbestos matrix without leaving a discrete surface layer.

X. Encapsulation: Treatment of ACM with an encapsulant.

Y. Enclosure: The construction of an airtight, impermeable, permanent barrier around asbestos-containing material to control the release of asbestos fibers into the air.

Z. Filter: A media component used in respirators to remove solid or liquid particles from the respired air.

AA. Friable Asbestos Material: Material that contains more than 1.0% asbestos by Polarized Light Microscopy (PLM), and that can be crumbled, pulverized, or reduced to powder by hand pressure when dry. This includes previously non-friable materials which become damaged to the extent that, when dry, may be crumbled, pulverized or reduced to powder by hand pressure.

BB. Furnish: Except as otherwise defined in greater detail, the term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.

CC. General Supervisor: Site Superintendent, Foreman is the Contractor's representative at the work site. This person can be the Competent Person required by OSHA, 29 C.F.R. 1926.1101.

DD. Glovebag: A sack (typically constructed to 6 mil transparent polyethylene) with two inward projecting long sleeve gloves, which are designed to enclose an object from which an asbestos-containing material is to be removed.

EE. HEPA Filter: A high efficiency particular air (HEPA) filter that removes from air 99.97% or more of monodispersed dioctylphthalate (DOP) or dioctylsebacate (DOS) particles having a mean particle diameter of 0.3 microns.

FF. HEPA Filter Vacuum Collection Equipment (or vacuum cleaner): HEPA filtered vacuum collection equipment with a filter system capable of collecting and retaining asbestos fibers. Filters shall be 99.97% efficiency for retaining fibers of 0.3 microns or larger.
GG. Indicated: The term "Indicated" is a cross-reference for Notes or Schedules on Drawings, to other paragraphs or Schedules in the Specifications, and to similar means of recording requirements in Contract Documents.

HH. Install: Unless defined in greater detail, "install" is used to describe operations at the project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working on dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

II. Installer: The "installer" is defined as the entity (person or firm) engaged by the Contractor or Sub-Contractor to perform a particular trade at the work site, including installation, erection, application and similar required operations. Such entities (installers) shall be expert in operations they perform.

JJ. Landfill Receipt: Document signed by a landfill operator acknowledging the receipt of ACM waste.

KK. Manifest: A document detailing chain of custody for ACM waste hauled.

LL. Negative Pressure Enclosure: Enclosure inside of which the air pressure is maintained so that the air pressure differential, as related to outside pressure, stays a minimum of -0.02 column inches of water for the duration of abatement until successful final air clearance is achieved. A manometer shall be utilized as required by OSHA to document the actual air pressure differential.

MM. Negative Pressure Glovebag: A glovebag that is composed of flexible plastic that can be subjected to negative pressure without collapsing.

NN. Negative Pressure Respirator: A respirator in which the air pressure inside the respiratory-inlet covering is positive during exhalation in relation to the air pressure of the outside atmosphere and negative during inhalation in relation to the air pressure of the outside atmosphere.

OO. Owner: Colonial Heights Public Schools

PP. Permissible Exposure Limit (PEL): The Contractor shall ensure that no employee is exposed to an airborne fiber concentration of
asbestos in excess of the PEL expressed as an 8-hour time weighted average (TWA) as determined by the OSHA Reference Method of 29 C.F.R. 1926.1101 (Current PEL for asbestos is 0.1 fiber/cc.).

QQ. Personal Sampling Monitoring: Air samples taken in the breathing zone of workers as required by OSHA 29 C.F.R. 1926.1101.

RR. Air pressure difference between the Work Area and surrounding areas caused by exhausting air from the Work Area.

SS. Pressure Differential System: A local exhaust system, utilizing HEPA filtration, capable of maintaining a pressure differential inside the Work Area and a constant airflow from adjacent areas into the Work Area and exhausting the filtered air outside the Work Area.

TT. Project Manager (Contractor): The asbestos Contractor's employee responsible for the total oversight of the project.

UU. Project Officer: The State employee responsible for overall contract administration.

VV. Plasticize: Means to cover floors and walls with polyethylene sheeting as herein specified and in accordance with the temporary Enclosure Section.

WW. Protection Factor: The ratio of the ambient concentration of an airborne substance to the concentration of the substance inside the respirator at the breathing zone of the wearer. The protection factor is a measure of the degree of protection provided by a respirator to the wearer.

XX. Provide: Except as otherwise defined in greater detail, the term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

YY. Qualified Person (QP): A Registered Architect, Professional Engineer, or Certified Industrial Hygienist who has successfully completed training and is therefore accredited under a legitimate State Model Accreditation Plan as described in 40 CFR 763 as a Building Inspector, Management Planner, Project Monitor, and Asbestos Project Designer. The QP must be qualified to perform visual inspections as indicated in ASTM E 1368. The QP shall be appropriately licensed in the State of Virginia as a Project Monitor.
and Project Designer. For this project, the QP shall be Mr. Christopher J. Chapman of ECS Mid-Atlantic, LLC in Richmond, Virginia. However, if the Building Owner decides to hire another firm as the Project Monitor, then the contracted firm shall become the QP and will be responsible for any additional sampling, implementation, procedural recommendations, and scope interpretations for the project.

ZZ. Regulated ACM: Means friable ACM, non-friable ACM that has become friable, non-friable ACM that will be or has been subjected to sanding, grinding, cutting or abrading or non-friable ACM that has a high probability of becoming or has become crumbled, pulverized or reduced to powder by the forces expected to act on the ACM during renovation or demolition.

AAA. Regulated Area: An area where asbestos removal operations are performed which is isolated by physical boundaries to prevent entry of unauthorized persons or the spread of asbestos dust, fibers or debris. Within this area, the airborne concentration of asbestos could reasonably be expected to exceed the PEL.

BBB. Removal: The taking out or stripping of all ACM from a damaged area or associated area or space.

CCC. Respirator: A device designed to protect the wearer from the inhalation of harmful atmospheres.

DDD. Short-Term Exposure Limit (STEL): A "ceiling" concentration, identified in OSHA regulations, of an airborne substance that shall not be exceeded for the duration of any 30-minute period (Current STEL for asbestos is 1.0 fiber/cc.).

EEE. Submittal: Items that are required to be presented to the Project Officer and/or the QP for review, consideration or decision.

FFF. Surfacing Material: Material in a building that is sprayed-on, trowelled-on or otherwise applied to surfaces or structural members for acoustical, fireproofing or other purposes.

GGG. Surfactant: A chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.
HHH. Testing Laboratory: The "testing laboratory" is an independent entity to perform specific air sampling and analysis at the work site and associated areas, to report and (if required) interpret results. Analysis shall be performed by a laboratory accredited by the American Industrial Hygiene Association (AIHA) and having demonstrated a proficient rating in AIHA's Proficiency Analytical Testing (PAT) Program. The laboratory shall be licensed by the Virginia Department of Commerce as an Asbestos Analytical Laboratory. The laboratory shall also be accredited by the National Institute of Standards and Technology (NIST) through the National Voluntary Laboratory Accreditation Program (NVLAP) for bulk sample analysis and air sample analysis by TEM (TEM Method of 40 C.F.R. 763, Subpart E, Appendix A).

III. Time Weighted Average (TWA): The average concentration of a contaminant in air during a specific time period.

JJJ. Visible Emissions: Any emissions containing particulate asbestos material that are visually detectable without the aid of instruments. This does not include condensed water vapor.

KKK. Waste Shipment Record: Means the original shipping document, originated and signed by the waste generator (Abatement Contractor) used to track and substantiate the disposal of ACM waste as described in 40 C.F.R. Part 61.

LLL. Waste Generator: Licensed Asbestos Abatement Contractor removing ACM waste from the property.

MMM. Wet Cleaning: The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning utensils that have been dampened with amended water or diluted removal encapsulant and afterwards thoroughly decontaminated or disposed of as asbestos-containing waste.

NNN. Work Area: The area where asbestos-related work or removal operations are performed; the Work Area is defined and/or isolated to prevent the spread of asbestos dust, fibers, or debris, and entry by unauthorized personnel. The Work Area is a Regulated Area as defined by 29 C.F.R. 1926.1101.

OOO. Work Site: The term "work site" is defined as the space available to the Contractor for performance of the work either exclusively or in conjunction with others performing other work as part of the project.
ABBREVIATIONS AND NAMES

The following acronyms or abbreviations referenced in Contract Documents are defined to mean the associated names. Both names and addresses are subject to change and are believed to be, but are not assured to be accurate and up-to-date as of the date of the Contract Documents:

ACM  Asbestos Containing Material

AIA  American Institute of Architects
1735 New York Avenue, N.W.
Washington, DC.  20006
(202) 626-7474

ANSI  American National Standards Institute
1430 Broadway
New York, NY  10018
(212) 354-3300

ASTM  American Society for Testing and Materials
1916 Race Street
Philadelphia, PA  19103
(215) 299-5400

CFR  Code of Federal Regulations
Available from Government Printing Office
Washington, DC.  20402 (Usually first
Published in Federal Register)

EPA  Environmental Protection Agency
1200 Pennsylvania Ave NW
Washington, DC.  20004
(202) 564-4700

MSHA  Mine Safety and Health Administration

NIOSH  National Institute for Occupational Safety and Health

NIST  National Institute of Standards and Technology
(U.S. Department of Commerce)
1.5 INFORMATION TO BE SUBMITTED AFTER CONTRACT IS AWARDED

A. Immediately upon award of the Contract, and before any work is commenced, Abatement Contractor shall submit to the Owner and Engineer the data listed below. The documentation shall be in quantity to allow the Owner to retain two copies and the Engineer to retain one copy. The data shall show compliance with the requirements of the Contract Documents and governing regulations.


2. Containment and shrouding procedures, including any unusual conditions.

3. Air sampling plan.

4. Name of laboratory to be used in air sample analysis and copy of American Industrial Hygiene Association (AIHA) Accreditation, if required.

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5. Location of change and decontamination area, if required.

6. Location of landfill for disposal of asbestos waste that has been approved by EPA.

7. Manufacturer's technical data sheets for mastic removers, etc.

8. Copies of Asbestos Worker Licenses, Asbestos Supervisor Licenses, and appropriate related documentation (proof of medical examination, respirator fit test, and certification).

9. Notifications to all appropriate state and federal agencies and local fire and police departments.

1.6 SCOPE OF WORK

A. The Scope of Work includes, but is not necessarily limited, to the following:

The Abatement Contractor shall be responsible for removal of all asbestos-containing materials impacted by this project: asbestos containing gray brittle door frame caulking, ceiling caulking, exterior soffit caulking, and transite panels located in the exterior soffit.

The Abatement Contractor has the responsibility for determining actual quantities of materials to be removed and reviewing the scope of work and construction documents, unless otherwise specified. The Contractor should allow under their base bid for the removal of all materials as described in the survey report and/or referenced in this specification. All presumed/newly discovered asbestos-containing materials (P ACM) shall be tested prior to removal by the Owner’s project monitor. The Abatement Contractor shall assist the Owners project monitor in sample collection. The Abatement Contractor shall not remove any of the PACM/newly discovered ACMs without the approval of the Owner or Owner’s representative. The Owner or the Owner’s representative will verify quantities as they are removed.
All mobilizations and permit notifications shall be the Abatement Contractors responsibility and included in the unit pricing.

This section outlines all work necessary to reduce air concentrations of asbestos to the specified level and maintain the specified asbestos control limits during the life of the contract. It also contains requirements for removal, containment, and disposal of asbestos-containing materials. The work specified in this document consists of the provision of services for the removal and disposal of asbestos-containing building materials (ACBMs). Asbestos materials have been identified in the areas where work will be performed.

All asbestos abatement work shall be performed by competent, licensed (by the Virginia Department of Professional and Occupational Regulation) persons, trained, qualified, and knowledgeable in the techniques of abatement, handling, and disposal of ACBMs and materials contaminated by asbestos, in accordance with pertinent local, state, and federal regulations.

With regards to scheduling all work, the asbestos abatement contractor will be required to coordinate the abatement activities while working under the Owner. For this project, the Contractor shall assume critical barriers shall be erected between all work areas and occupied areas of the school. The Contractor shall operate a negative air machine in the vicinity of all asbestos removal work.

During the project the Abatement Contractor will be inspected by the Owner’s industrial hygienist. If the Abatement Contractor is not in compliance with the specifications and applicable regulations, the contractor will stop all work immediately until all observed deficiencies are resolved. Any standby time will be at the Abatement Contractor’s expense. If the Contractor fails a final visual inspection any re-cleaning including additional project monitor visits will be the responsibility of the contractor and/or back charged to the contractor.

A 20-day Notification is required for this project to VA DOLI.
The Abatement Contractor shall remove the following materials as asbestos containing:

- Asbestos containing gray caulking located on the joint between the front entrance soffit and the brick face of the building. The abatement contractor shall remove this material substantially intact without a negative pressure enclosure in accordance with Part 3 - Execution of this document. The Contractor shall use drop cloths around all areas where removal is to occur. As part of the base bid, the Abatement Contractor shall include all costs necessary for removal of 100 linear feet of this material. The Abatement Contractor shall also provide unit pricing for removal of this material (per linear foot) if additional amounts of this material are encountered. The Contractor shall lay drop poly out underneath all work areas. The Contractor shall schedule removal work when the school is not occupied.

- All asbestos containing gray caulking located the front entrance door frames and exterior storage closet (Between rooms E104 and E105) door frames (interior/exterior as needed). The abatement contractor shall remove this material substantially intact without a negative pressure enclosure in accordance with Part 3 - Execution of this document. The Contractor shall use drop cloths around all areas where removal is to occur. As part of the base bid, the Abatement Contractor shall include all costs necessary for removal of all caulking associated with these doors. The Abatement Contractor shall also provide unit pricing for removal of this material (per linear foot) if additional amounts of this material are encountered. The Contractor shall lay drop poly out underneath all work areas. The Contractor shall schedule removal work when the school is not occupied.

- Asbestos containing gray caulking located on the ceiling in the exterior storage room (Rooms E104 and E105). The caulking is present where CMU block partition walls (planned for demolition) meet the transite ceiling panels. The abatement contractor shall remove this material substantially intact without a negative pressure enclosure in accordance with Part 3 - Execution of this document. The Contractor shall use drop cloths around all areas where removal is to occur. As part of the base bid, the Abatement Contractor shall include all costs necessary for removal of 100 linear feet of this material without disturbance of the transite panels.
The Abatement Contractor shall also provide unit pricing for removal of this material (per linear foot) if additional amounts of this material are encountered. The Contractor shall lay drop poly out underneath all work areas. The Contractor shall schedule removal work when the school is not occupied.

- Asbestos containing transite panels located beneath the front entrance soffit (planned for demolition). The abatement contractor shall remove this material substantially intact without a negative pressure enclosure in accordance with Part 3 - Execution of this document. The Contractor shall use drop cloths around all areas where removal is to occur. As part of the base bid, the Abatement Contractor shall include all costs necessary for removal of 425 linear feet of this material. The Abatement Contractor shall also provide unit pricing for removal of this material (per linear foot) if removal of this material elsewhere in the building is planned. The Contractor shall schedule removal work when the school is not occupied.

Note 1: For all unit cost pricing the Abatement Contractor shall assume that all mobilization, set-up, insurance, notification, profit etc. are to be included in the unit cost estimate. Unit cost estimates should be provided for the materials listed below.

- Transite panels – per square foot
- Caulking – per linear foot
- Ceramic wall tiles mastic – per square foot
- Vapor barrier/ waterproofing materials (In wall) – per square foot

Note 2: The contractor is responsible for verifying all quantities of materials to be removed in order to complete the scope of work.

Note 3: Transite ceiling panels located in the exterior storage room are not planned for demolition according to Enteros Design Demolition drawing D1.1 (Dated 02/15/2017)

Note 4: Room numbers referenced above are based on Enteros Design Floor Plan drawing number A2.1 (Dated 04/17/2017)
1.7 QUALITY CONTROLS

A. The asbestos removal Contractor's superintendent shall be on the site each day during removal and he/she shall be knowledgeable, experienced and competent in this type of work.

B. The asbestos removal Contractor shall be responsible for any damage to the building and its contents resulting from leakage or spillage of water caused by the asbestos removal activities.

C. Authorities of the Commonwealth of Virginia shall be notified of the starting date of the asbestos removal project by the asbestos removal Contractor.

D. The Owner reserves the right to halt the project work until hazardous or potentially hazardous conditions are corrected.

E. The Owner reserves the right to independently perform such analysis and tests at any time as he deems necessary to ensure and protect safety of the project.

1.8 WORKER PROTECTION - ASBESTOS REMOVAL PROCEDURES & EQUIPMENT

F. Comply with all EPA and OSHA Regulations, and follow EPA workplace guidelines.

G. Provide and maintain negative air systems for all work areas, for the duration of asbestos removal work.

H. Submit certificates signed by each employee indicating that the employee has received Virginia DPOR-approved training and is currently licensed in the Commonwealth of Virginia in the proper handling of materials that contain asbestos.

I. All workers shall be trained and knowledgeable of the following:
   1. The hazards of asbestos exposure.
   2. Use of respirators and protective clothing.
   3. Use of personal air monitoring equipment.
4. Use of decontamination facilities and designated showers.

J. Respiratory Equipment and Air Sampling Requirements

1. Provide workers with respiratory equipment in accordance with OSHA 1910.134, as suitable for the asbestos exposure in the work area.

2. Provide sufficient filters for replacement of disposable type filters.

K. Keep a copy of written respiratory program on the job site at all times.

L. Personnel breathing zone air samples shall be obtained by the Abatement Contractor on a daily basis for determination of both 8-hour time weighted average (TWA) and ceiling concentrations of employee exposures.

M. The sampling schedule shall be posted outside of the containment area showing sample frequency, duration of the sample, and pump flow rates.

N. Results of all samples shall be posted within 24 hours of sampling outside of the containment area, and maintained there until the job has been concluded. This data shall include both the results of individual samples and the results of 8-hour TWA determinations. Posted results should include a synopsis of work activities of which the results are representative.
AIR MONITORING

O. Provide air monitoring in the work areas throughout all asbestos stripping, removal and cleaning operations to ensure that the workers are adequately protected at all times. All personal air monitoring for OSHA compliance shall be the responsibility of the Contractor.

P. Samples for air monitoring shall be collected by a competent person in accordance with methods prescribed in Chapter X of the Federal OSHA Industrial Hygiene Field Operations Manual or by equivalent procedures.

Q. Air monitoring shall be in compliance with 1910.1001 (f) of the OSHA standards.

R. Air samples must be analyzed by NIOSH method 7400 by a laboratory accredited by AIHA.

S. Air monitoring (protection of the Abatement Contractor's employees) shall be provided throughout the removal and cleaning operations. Air monitoring shall be conducted and evaluated by a testing laboratory employed by the Abatement Contractor to ensure that the Contractor is complying with applicable EPA and OSHA regulations.

T. Environmental samples outside of containment and clearance sampling shall be performed by the QP (ECS Mid-Atlantic, LLC.), as applicable.

U. Area samples shall be collected outside the containment in areas of highest risk of contamination.

V. Samples shall be made on a daily basis outside the containment.
W. All analytical results shall be presented as signed "Certificates of Analysis". Form shall state:

- Date and time sampling began
- Flow rate of samples
- Sampling time elapsed
- Concentration of fibers
- Site/individual sampled
- Signature of Analyst

X. Two copies of analytical results shall be delivered in writing to the job site within 24 hours of sample collection (excluding non-working days).

Y. Sampling schedules for area samples shall be posted outside the containment area showing sampling frequency, sample duration, and pump flow rates.

Z. Results of area samples made outside the containment shall be posted within 24 hours and maintained in the area showing the fiber concentrations. Posted results should include a synopsis of the day’s activities of which the samples are representative.

AA. The Owner shall be informed immediately of any area samples outside the containment with results exceeding 0.01 fibers/cc.

BB. Copies of the results of all samples made in areas where Owner's employees are or may be exposed shall be given to the Owner to assure maintenance of records in compliance with OSHA standard 1910.1001 (i) (1).

CC. Operations shall be discontinued immediately at any time visible emissions are observed emanating from the containment.
PART 2 - PRODUCTS

2.1 PRODUCTS AND EQUIPMENT

A. Protective plastic (polyethylene) sheeting of minimum 6 mil thickness and size to provide protection to all equipment, floors, walls, piping, ductwork, and all other exposed areas, with minimum frequency of joints.

B. Seal tape shall be glass fiber or other type capable of sealing joints of adequate sheets of plastic for the attachment of plastic sheeting to finished or unfinished surfaces of dissimilar materials under either dry or wet conditions, including use of amended water.

C. Disposal Containers: Bags and drums to be used for disposal of asbestos waste shall be suitable to receive and retain any asbestos-containing or contaminated materials until disposal at an EPA approved and certified waste disposal site. Six mil bags shall be used.

D. Warning Labels: As required by OSHA Regulation 29 CFR 1910.1001 (g) (2).

E. Surfactant (wetting agent for amended water): Acceptable surfactant.

F. Encapsulant: Acceptable encapsulant

PART 3 - EXECUTION

3.1 INSTALLATION

A. Isolate the work areas for the duration of the work by completely demarcating the work area with red asbestos-hazard tape and appropriate asbestos warning signs. A barrier shall be placed inside the building to prevent entrance in to the work area through exterior doors.
B. Cover the ground surface around the building with plastic sheeting sealed with tape and glue securely. Use a minimum of two layers of 6-mil plastic sheeting on floors.

C. Contractor shall provide a decontamination area, with a HEPA vacuum, for workers to remove their protective suit. Abatement workers should wear two suits during work activities. Protective clothing should be removed, and the HEPA vacuum used to decontaminate, prior to exiting the work area.

D. Maintain work area in tidy conditions. Ensure that barriers and plastic linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery. Visually inspect enclosures at the beginning and end of each work period.

E. Post the EPA and OSHA regulations and any applicable state and local government regulations at the job site in locations clearly visible to employees and others. Attention is directed to all requirements of the Contract Documents concerning precautionary procedures mandated thereby and by OSHA and EPA for the protection of personnel, the public, and the environment from exposure to or possible contamination by asbestos fibers.

F. In addition to requirements for asbestos protection, comply with all other applicable requirements of 29 CFR 1910 and 1926.

G. Provide hard hats, eye protection, and foot protection in those areas where such protective measures are required by OSHA regulations.

H. Workers shall always wear a respirator properly fitted on the face while in the work area. Instruct and train workers to use respirators properly in accordance with the requirements of the American National Standards Practices for Respiratory Protection (ANSI Z88.2-1969). Ensure that workers wear the appropriate respirator at all times while in the work area. Each employee shall be tested for respirator fit in accordance with the cited ANSI standard.

I. Workers shall wear disposable full body coveralls and disposable head and foot coverings in the work area. If non-disposable footwear such as protective shoes are required and disposal foot coverings are not suitable, the non-disposable protective footwear shall be left in the work area at all times until disposal at job completion, then disposed of as asbestos contaminated waste.
J. Decontamination Procedures: Submit to the Owner, a protection program to ensure that workers and others follow an established decontamination sequence utilizing the aforementioned facilities. They shall ensure that gross contamination and debris is removed from protective clothing and equipment prior to egress from the work area. Respiratory protective equipment shall be removed last, to prevent inhalation of fibers during removal of contaminated clothing. The Abatement Contractor shall provide a plan for receipt, inspection, cleaning and storage of respiratory protective equipment in such a manner as to avoid contamination of clean areas. For Class II removal alternative decontamination procedures shall be considered.

K. Post the EPA and OSHA regulations and any applicable state and local government regulations at the job site in locations clearly visible to employees and others. Attention is directed to all requirements of the Contract Documents concerning precautionary procedures mandated thereby and by OSHA and EPA for the protection of personnel, the public, and the environment from exposure to or possible contamination by asbestos fibers.

L. In addition to requirements for asbestos protection, comply with all other applicable requirements of 29 CFR 1910 and 1926.

M. Provide hard hats, eye protection, and foot protection in those areas where such protective measures are required by OSHA regulations.

N. Workers shall always wear a respirator properly fitted on the face while in the work area. Instruct and train workers to use respirators properly in accordance with the requirements of the American National Standards Practices for Respiratory Protection (ANSI Z88.2-1969). Ensure that workers wear the appropriate respirator at all times while in the work area. Each employee shall be tested for respirator fit in accordance with the cited ANSI standard.

O. Workers shall wear disposable full body coveralls and disposable head and foot coverings in the work area. If non-disposable footwear such as protective shoes are required and disposal foot coverings are not suitable, the non-disposable protective footwear shall be left in the work area at all times until disposal at job completion, then disposed of as asbestos contaminated waste.
3.2 METHODS OF REMOVAL FOR ENCLOSED WORK AREAS

A. A low-pressure fine spray of amended water shall be applied to reduce fiber release preceding removal. The asbestos shall be saturated sufficiently to retard emission of airborne fibers. If the asbestos is thick and detaches in chunks having dry bottoms, amended water shall be sprayed over the material as it is loosened and removed.

B. Following removal of asbestos-containing material, all plastic sheeting, tape, cleaning material, clothing and all other disposal materials or items used in the work area shall be packed into sealable plastic bags (6 mil minimum), sealed and placed into metal or fiber containers or skips for transport. The containers or skips shall be labeled as prescribed by OSHA Specifications 29 CFR 1910.1001 (g).

C. All containers shall be cleaned and thoroughly decontaminated before leaving the work area by being passed through the shower, or through the airlock and container cleaning assembly, as follows:

1) Containers shall first be gross-cleaned by vacuuming and then damp-wiped, before being placed into shower container or cleaning airlock.

2) If a container being transferred from the work area via a shower has dried, it shall be wet-wiped again before being transferred past the shower.

D. Transport the sealed container or skips to an EPA approved and certified waste disposal site. The Contractor shall provide the Owner with a signed certificate listing the quantity of materials delivered to the disposal site, a description of the location of the site, and a statement attesting to the fact that the site is an EPA and State approved disposal location. The signatures of the Abatement Contractor, transporter, and disposal site operator must appear on the certificate. The Abatement Contractor shall ensure that the operator leaves damaged bags in the delivery containers and that the entire contaminated container is buried, however, sealed plastic bags may be dumped from the containers into the burial site and uncontaminated containers may be reused. The Contractor shall certify that any reused containers have not contained damaged or broken bags of asbestos or other asbestos-contaminated material.

AB - 23 ASBESTOS REMOVAL
E. Disposal of all asbestos waste shall occur at a prearranged disposal site in accordance with regulations of the Virginia Department of Environmental Quality-Waste Division and OSHA Regulation 29 C.F.R. 1910.1001.

3.3 DECONTAMINATION OF WORK AREA

A. Replace pre-filter and the intermediate filter in the Air Filtration Device (AFD). Clean all surfaces of the Work Area, including the outside surface of critical barrier sheeting, tools, scaffolding and/or staging, by HEPA-filtered vacuuming, then damp clean and mop the area. Do not dry-dust or dry-sweep. Continue cleaning until there is no visible dust, debris or residue on polyethylene sheeting and other surfaces.

B. Perform a complete visual inspection of all Work Area surfaces and contents. If any debris or residue is found, continue cleaning until no visible debris or residue is found.

C. Allow sufficient time for the Work Area to completely dry while operating HEPA filtered fan units. Maintain operation of negative pressure differential system in operation during the drying period.

D. The QP shall conduct a visual inspection of the Work Area when the abatement and decontamination is complete and when the Contractor's supervisor requests such inspection.

E. After a successful visual inspection, an approved lock down encapsulant shall be applied to all the surfaces in the Work Area. The encapsulant used shall not impede reinsulation. After sufficient drying time, determined by the QP, the final clearance can take place.

F. Additional cleaning required after the first final cleaning will be performed at the expense of the contractor. Additional hours required by the QP will also be an expense paid for by the Contractor, as well as necessary repeated final air clearance analyses.

G. After final air samples are found to meet clearance criteria (if applicable), remove critical barriers and completely dismantle and remove Decontamination Area.
H. Seal HEPA filtered AFDs with 6-mil polyethylene sheeting and duct tape to form a tight seal at intake, before unit is moved from the Work Area.

3.4 FINAL INSPECTION AND TESTING

A. After cleaning and decontamination of the workspace has been conducted, and if a high degree of cleanliness has been achieved, notify the QP that the workspace is ready for inspection and final testing. The QP will visually inspect each Work Area where such activity was conducted to determine whether the clean up has been properly completed and to detect any visible asbestos dust or contamination. The QP shall conduct a visual inspection of the Work Area when the abatement and decontamination is complete and when the Contractor's supervisor requests such inspection. The visual inspection will be conducted in general compliance with ASTM E 1368, Standard Practice for Visual Inspection of Asbestos Abatement Projects.

B. If the visual inspection does not reveal any dust or other signs of contamination, the final air sampling will take place.

C. Final air clearance testing shall be conducted by the QP generally using air sampling techniques in the Work Area in accordance with EPA 40 C.F.R. Part 763.90(i), (2, i) and Appendix A. Due to the nature of this project, ambient air sampling, or only visual inspections may be the only sampling required.

D. Phase contrast microscopy analysis will be performed in accordance with NIOSH Method 7400. Final test results shall show contamination levels not to exceed 0.01 f/cc when using phase contrast microscopy (PCM). Final (clearance) air samples shall capture a minimum air volume of 1,200 liters per sample. The number of clearance air samples and air volume may vary depending on size of Work Area and other variables.

E. If elevated airborne fiber counts are detected on clearance samples, the Abatement Contractor will be responsible for re-cleaning of the sampled area(s) at no additional cost or schedule impact to the Owner. Additional testing will be performed following the re-cleaning to document that acceptable levels have been
achieved. The Abatement Contractor will be responsible for fees and expenses related to retesting the area after re-cleaning.

F. Alternatively, due to the nature of the work, a PCM air sample may be collected during work activities to be used as a passive final clearance sample.

-- End of Section --
SECTION 024113 - SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY
   A. This Section includes the following:
      1. Demolition and removal of existing asphalt and/or concrete pavement, concrete and/or asphalt walks, curbs and gutters, and other exterior site items indicated or not indicated which interfere with the Work.
      2. Removal and/or relocation of existing underground utilities.
      3. Removal and disposal of existing sanitary sewer pipe, water pipe, storm drainage pipe and appurtenances indicated. Filling of existing pipes to be abandoned in place.
      4. Removal and relocation of existing light poles.

1.3 DEFINITIONS
   A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
   B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.
   C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.
   D. Existing to Remain: Protect items indicated to remain against damage and soiling. When permitted by the Architect, items may be removed to a suitable, protected storage location and then cleaned and reinstalled in their original locations.
1.4 MATERIALS OWNERSHIP
   A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, remove demolished materials from the site with further disposition at the Contractor's option.
   B. Storage or sale of removed items or materials on-site will not be permitted.
   C. Historical items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to the Owner, which may be encountered, remain the Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to the Owner.

1.5 SUBMITTALS
   A. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by the Work.
   B. Record drawings at Project closeout.
      1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.
   C. Proposed dust-control measures.
   D. Schedule of selective demolition activities indicating the following:
      1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
      2. Interruption of utility services.
      3. Coordination for shutoff, capping, and continuation of utility services.
      4. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
      5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
   E. Inventory of items to be removed and salvaged or turned over to Owner.
   F. Landfill records indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
1.6 QUALITY ASSURANCE
   A. Regulatory Requirements: All work shall comply with Federal, State and Local laws and regulations concerning hauling and disposal of demolition debris.
   B. Notify the proper agencies prior to the start of work and obtain all necessary permits for this work.

1.7 PROJECT CONDITIONS
   A. Owner assumes no responsibility for actual condition of items or structures to be demolished. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner to the extent practical. However, minor variations may occur due to Owner’s removal and salvage operations prior to the start of demolition work.
   B. The location of existing underground utilities indicated is approximate only. Field locate all existing underground utilities in the area of work, regardless of whether or not they are indicated. Call “Miss Utility” prior to the start of demolition work for assistance in the location of existing underground utilities.
   C. Should charted, uncharted or incorrectly charted utilities be encountered during demolition, contact the Architect immediately for instructions. Cooperate with Owner and utility companies to keep services and facilities in operation.
   D. Do not interrupt existing utilities serving facilities occupied and used by the Owner and others, except when permitted in writing by the Owner. Provide acceptable temporary utility service as required to maintain Owner’s operations.

1.8 SCHEDULING
   A. Owner will occupy portions of the building immediately adjacent to the Work. Conduct selective demolition so that the Owner’s operations will not be disrupted. Provide not less than 72 hours notice to Owner of activities that will affect Owner’s operations.
   B. Arrange selective demolition schedule so as not to interfere with Owner’s on-site operations.
   C. Notify and coordinate any required relocation and/or removal of existing underground utilities, poles, meters or other above ground appurtenances with the appropriate utility company (i.e. power, telephone, cable and natural gas/propane) prior to the start of selective demolition work.

1.9 PAYMENT FOR UTILITY REMOVAL / RELOCATIONS
   A. Electric Service – The Contractor shall pay for the relocation of all electric lines.
   B. Phone Service – The Contractor shall pay for the relocation of all phone lines.
C. Cable Television – The Contractor shall pay for the relocation of all cable television lines.

D. Gas – The Contractor shall pay for the relocation of all gas lines.

1.10 USE OF EXPLOSIVES

A. Do not use explosives to perform selective site demolition work.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Call “Miss Utility” prior to the start of demolition work for assistance in the location of existing underground utilities. Field locate all existing underground utilities in the area of work, regardless of whether or not they are indicated.

B. Should uncharted or incorrectly charted existing utilities be identified, contact the Architect immediately for instructions. Provide a scale drawing with the location of the uncharted or incorrectly charted utilities for use by the Architect in preparing additional direction.

C. Verify that utilities indicated as removed, abandoned and/or relocated have been disconnected and capped.

D. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

E. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged and turned over to the Owner.

3.2 PROTECTION OF PERSONS AND PROPERTY

A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.

2. Protect existing site improvements, appurtenances, and landscaping to remain.

D. Barricade areas of demolition occurring as part of this work, and post with warning lights as required by authorities having jurisdiction.

E. Protect structures, buildings, utilities, walks, pavements, existing vegetation and other facilities to remain from damage caused by settlement, lateral movement, undermining, washout and other hazards created by demolition operations.

3.3 POLLUTION CONTROLS

A. Perform all work in accordance with the requirements of the latest edition of the Virginia Erosion and Sediment Control Handbook and those of the local Erosion Control official.

B. Clean adjacent structures and improvements of dust, dirt, and debris caused by the Work. Return adjacent areas to condition existing before start of selective demolition.

3.4 DEMOLITION OF EXISTING FACILITIES

A. Electric Service

1. Coordinate the removal and/or relocation of existing utilities with Dominion Virginia Power.

2. Contact Power Company Representative at 804-862-6024 to arrange for required removal and/or relocation of existing service.

B. Phone Service

1. Coordinate the removal and/or relocation of existing utilities with Verizon Virginia.

2. Contact Phone Company Representative at 804-772-4298 to arrange for required removal and/or relocation of existing service.

C. Cable Television

1. Coordinate the removal and/or relocation of existing utilities with Comcast.

2. Contact Cable Company Representative at 804-915-5259 to arrange for required removal and/or relocation of existing service.
D. Gas
   1. Coordinate the removal and/or relocation of existing utilities with Columbia Gas of Virginia.
   2. Contact Gas Company Representative at 804-768-6455 to arrange for required removal and/or relocation of existing service.

E. Utilities
   1. Coordinate the removal and/or relocation of existing utilities with the appropriate utility companies.
   2. Remove existing utilities as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and to local jurisdictional codes.
   3. Provide adequate means of support and protection during demolition and other construction operations for existing utilities that are to remain in place. Repair utilities damaged by construction operations to the satisfaction of the utility owner.

F. Asphalt Pavement
   1. Remove asphalt concrete pavement by sawcutting to the full depth of the pavement. Provide neat sawcuts at the limits of pavement removal indicated.

G. Concrete Pavement, Walks and Curbs
   1. Remove concrete pavement and walks to the nearest joint. Sawcut concrete if joints are not present adjacent to the area of demolition.
   2. Sawcut concrete along straight lines to a depth of not less than 2 inches. Break out remainder of concrete, provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or sawcut entirely through concrete.

H. Light Poles
   1. Remove and relocate light poles as indicated. If light poles are owned by a public utility, coordinate the relocation with them.

I. Fencing
   1. Remove existing chain-link fencing as indicated on the drawings.
   2. Turn fencing materials removed over to the Owner.

J. Playground Equipment
   1. Remove, store and protect existing playground equipment interfering with proposed construction.
   2. Turn play equipment over to the Owner for reinstallation following the completion of construction in the area.
3.5 DISPOSAL OF DEMOLISHED MATERIALS
   A. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
   B. Do not burn demolished materials or debris.
   C. Transport and legally dispose of demolished materials off of Owner's property.

3.6 CLEANUP AND REPAIR
   A. Upon completion of demolition work remove all tools, equipment and demolition materials from site. Remove demolition work area protection and leave areas clean.
   B. Repair any demolition performed in excess of that required. Return elements of construction and surfaces to remain to the condition existing prior to the start of construction. Repair adjacent construction or surfaces soiled or damaged by demolition work.

END OF SECTION 024113
SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Demolition and removal of selected portions of building or structure.
      2. Demolition and removal of selected site elements.
      3. Salvage of existing items to be reused or recycled.

1.2 MATERIALS OWNERSHIP
   A. Unless otherwise indicated, demolition waste becomes property of Contractor.
   B. Historic items, relics, antiques, and similar objects including, but not limited to,
      cornerstones and their contents, commemorative plaques and tablets, and
      other items of interest or value to Owner that may be uncovered during
      demolition remain the property of Owner.
      1. Carefully salvage in a manner to prevent damage and promptly return to
         Owner.

1.3 PREINSTALLATION MEETINGS
   A. Predemolition Conference: Conduct conference at Project site.

1.4 INFORMATIONAL SUBMITTALS
   B. Proposed Protection Measures: Submit report, including Drawings, that
      indicates the measures proposed for protecting individuals and property, for
      environmental protection , for dust control and, for noise control. Indicate
      proposed locations and construction of barriers.
   C. Schedule of selective demolition activities with starting and ending dates for
      each activity.
   D. Predemolition photographs or video.
   E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician.
1.5 CLOSEOUT SUBMITTALS
   A. Inventory of items that have been removed and salvaged.

1.6 QUALITY ASSURANCE
   A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.7 FIELD CONDITIONS
   A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner’s operations will not be disrupted.
   B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
   C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
   D. Hazardous Materials: It is expected that hazardous materials will be encountered in the Work.
      1. See specification sections regarding hazardous material abatement scope and requirements (included Asbestos abatement and Lead Paint), to be included in this Contract for the Work.
   E. Storage or sale of removed items or materials on-site is not permitted.
   F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
      1. Maintain fire-protection facilities in service during selective demolition operations.
   G. Arrange selective demolition schedule so as not to interfere with Owner’s operations.

1.8 WARRANTY
   A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Perform a survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

C. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition.
demolition and that maintain continuity of services/systems to other parts of building.

4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

   a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
   b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
   c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
   d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
   e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
   f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
   g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

   1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools
designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Maintain fire watch during and after flame-cutting operations.
5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
6. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner’s storage area on-site designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.
3.6 CLEANING

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119
SECTION 033000 - CAST-IN-PLACE CONCRETE FOR BUILDINGS

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.
   B. Related Requirements:
      1. Section 033300 "Architectural Concrete" for general building applications of specially finished formed concrete.

1.3 DEFINITIONS
   A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
   B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS
   A. Preinstallation Conference: Conduct conference at Project site.
      1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
         a. Contractor's superintendent.
         b. Independent testing agency responsible for concrete design mixtures.
         c. Ready-mix concrete manufacturer.
         d. Concrete Subcontractor.
         e. Special concrete finish Subcontractor.
2. 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, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness, concrete repair procedures and concrete protection.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

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 and supports for concrete reinforcement.

1. Include special reinforcement required for openings through concrete structures and dimensioned opening locations. Include applicable dimensions, sections, elevations, and details required to complete installation and coordination of the details, and typical details. Plan shall be drawn at a scale of no less than 1/8" per foot.

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 vapor retarder.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

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

1. Cementitious materials.
2. Admixtures.
3. Steel reinforcement and accessories.
4. Curing compounds.
5. Bonding agents.
6. Adhesives.
7. Vapor retarders.
8. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:
   1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

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

E. Field quality-control reports.

F. Minutes of preinstallation conference.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.8 DELIVERY, STORAGE, AND HANDLING

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

1.9 FIELD CONDITIONS

A. 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.

B. 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.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

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

1. ACI 301.
2. ACI 117.
3. ACI 315 (ACI 315M).
5. ACI 318.

2.2 STEEL REINFORCEMENT

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

B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. 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.

2.4 CONCRETE MATERIALS

A. 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.

B. Cementitious Materials:
1. Portland Cement: ASTM C 150/C 150M, Type I/II.
2. Fly Ash: ASTM C 618, Class F or C.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 2S coarse aggregate or better, graded. Provide aggregates from a single source.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM 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.


2.5 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.6 CURING MATERIALS

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

B. Absortive 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, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

2.7 RELATED MATERIALS

A. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

B. 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.

2.8 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.

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.

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.
2.9 CONCRETE MIXTURES, GENERAL

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

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.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

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

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Normal-weight concrete.

1. Minimum Compressive Strength: As indicated at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 5 inches, plus or minus 1 inch.

B. Slabs-on-Grade: Normal-weight concrete.

1. Minimum Compressive Strength: As indicated at 28 days.
2. Maximum W/C Ratio: 0.45.
4. Slump Limit: 4 inches, plus or minus 1 inch.

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
2.12 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.

PART 3 - EXECUTION

3.1 EMBEDDED ITEM INSTALLATION

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

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3.2 VAPOR-RETARDER INSTALLATION

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

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.3 STEEL REINFORCEMENT INSTALLATION

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

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

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

3.4 JOINTS

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

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls 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. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.5 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of reinforcement and embedded items is complete and that required inspections are completed.

B. 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.

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

1. Deposit concrete in horizontal layers of depth not to 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.

D. 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.
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.

3.6 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 restreighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
   a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

3.7 MISCELLANEOUS CONCRETE ITEM INSTALLATION

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.

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

D. 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. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does 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 does not interfere with bonding of floor covering used on Project.

3.9 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 1 part portland cement to 2-1/2 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 matches 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.

3.10 SPECIAL INSPECTIONS

A. Special Inspections will be performed by the Special Inspector or the Special Inspector’s Agency.

B. Verification and inspection of concrete construction shall be in accordance with Section 1705.3 of Virginia Construction Code 2012 and as follows:

C. 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.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
   1. Testing Frequency: Obtain one composite sample for each day’s pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
      a. When frequency of testing provides 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/C 231M, 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 or 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 two sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
   a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
   c. 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.
   d. 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.

7. 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.

8. 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.

9. 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.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
F. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

G. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION 033000
SECTION 042000 - UNIT MASONRY & CAST STONE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete masonry units (CMU's).
   2. Concrete building brick.
   3. Face brick.
   4. Reinforcement Anchors and Ties
   5. Mortar and Grout
   6. Steel reinforcing bars.
   7. Masonry-joint reinforcement.
   8. Embed Flashings
   9. Masonry Accessories
   10. Cast-Stone window sills

B. Related Sections:
   1. Division 01 Section "Quality Requirements" for quality control and mock-up requirements.
   2. Division 03 Section "Precast Architectural Concrete" for coordination.
   3. Division 05 Section "Metal Fabrications" for furnishing steel lintels for unit masonry.
   4. Division 05 Section "Cold-Formed Metal Framing" for supporting wall structure.
   5. Division 07 Section "Bituminous Dampproofing" for waterproofing.
   6. Division 07 Section "Thermal Insulation" for cavity insulation
   7. Division 07 Section "Sheet Metal Flashing and Trim"
   8. Division 07 Section "Joints and Sealants" for sealant of perimeter and control joints.

1.2 SUBMITTALS

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

B. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
C. Samples for Verification: For each type and color of exposed masonry unit and colored mortar.

D. Material Certificates: For each type and size of product indicated. For masonry units include data on material properties and material test reports substantiating compliance with requirements.

E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
   2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

F. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

G. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

C. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 01 Section 014000 "Quality Requirements" for mockups, as well as the following:
   1. Construct up to (4) four initial a wall mock-up panels sized 4 feet wide by 4 feet tall minimum, or larger as needed, to review selection of brick to match existing building’s brick.
   2. Once the brick is selected for color match, construct on wall mock-up panel sized 4 feet wide by 6 feet tall to include all aspects of the mock up.
   3. Include all types of brick masonry veneer, including banding, jack arch over window void, and all other special shapes and patterns, rowlock sill and cap. Include all mortar and colored mortar to be selected by architect prior to mock-up construction. Mock-up shall include both masonry and stud back up wall construction. Mock-up shall include minimum one brick control joint for sealant color selection review. Mock-up shall include all masonry and stone wall accessories.
4. Coordinate construction of mock-up between all required subcontractors, i.e., masonry, stud wall, weatherproofing, flashing, sealant, etc...

5. Construct mock-up in a location on site to ensure that it remains undisturbed and intact for the duration of construction.

D. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

E. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

F. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

G. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

1. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.

H. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1.

I. Manufacturer Qualifications: A qualified manufacturer of cast-stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials to project in undamaged condition.

B. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.

C. Store cementitious materials off the ground, under cover, and in dry location.
D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided

E. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

1.5 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

C. Store masonry materials under weatherproof cover to prevent damage from exposure to the weather.

D. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
   2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

E. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

F. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that comes in contact with such masonry.
   1. Protect base of walls from rainsplashed mud, mortar and concrete splatter by means of coverings spread on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings.

1.6 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

C. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi (13.1 MPa).
2. Density Classification: Light weight. Concrete building brick in first paragraph below is often used to adjust dimensions in CMU construction.

C. Concrete Building Brick: ASTM C 55.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.31 MPa).
2. Density Classification: Medium weight.

2.3 CONCRETE AND MASONRY LINTELS

A. General: Provide one of the following:
B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than CMUs.

C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 033000 "Cast-in-Place Concrete," and with reinforcing bars indicated. Concrete lintels are not to be used in any exposed locations.

D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in-place lintels until cured. Use masonry lintels if in any area that is exposed and visible.

2.4 BRICK

A. General: Provide shapes indicated and as follows:

1. For ends of sills and caps, and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
3. Provide "Lipped" brick at lintel angle conditions to conceal the edge of the angle with the bottom of the angle flush with the bottom of the brick.

B. Face Brick: Facing brick complying with ASTM C 216, Grade SW, Type FBS:

1. Face Brick (Typical): “Brick 1” (to match existing building brick)
   b. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi (23.10 MPa).
   c. Color: To match existing school brick color/finish
   d. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
   e. Size: (Actual Dimensions): 3-5/8 inches (89 mm) wide by 2-1/4 inches (57 mm) high by 7 5/8 inches (203 mm) long. 3 Courses = 8" vertically.
   f. Mortar Color: WR 2073, subject to mockup verification

2. Face Brick (Accent): “Brick 2" (Tan)
   b. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi (23.10 MPa).
   c. Color: To match existing school brick color/finish
d. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated “not effloresced.”

e. Size: (Actual Dimensions): 3-5/8 inches (89 mm) wide by 2-1/4 inches (57 mm) high by 7 5/8 inches (203 mm) long. 3 Courses = 8” vertically.

f. Mortar Color: WR 2073, subject to mockup verification

2.5 CAST-STONE UNITS (window sills as indicated on the drawings.)

A. Cast-Stone Units: Comply with ASTM C 1364.

1. Units shall be manufactured using the vibrant dry tamp method.
2. Units shall be resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.

B. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.

1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
2. Provide raised fillets at backs of sills and at ends indicated to be built into jamb.
3. Provide drips on projecting elements unless otherwise indicated.
4. Unless otherwise indicated. Provide sills fabricated as one piece per sill, or in the largest sections to minimize the number of joints. If joints are required, space joints to align with the center of a window mullion.

C. Cure Units as Follows:

1. Cure units in enclosed, moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F (38 deg C) for 12 hours or 70 deg F (21 deg C) for 16 hours.
2. Keep units damp and continue curing to comply with one of the following:

   a. No fewer than five days at mean daily temperature of 70 deg F (21 deg C) or above.
   b. No fewer than six days at mean daily temperature of 60 deg F (16 deg C) or above.
   c. No fewer than seven days at mean daily temperature of 50 deg F (10 deg C) or above.
   d. No fewer than eight days at mean daily temperature of 45 deg F (7 deg C) or above.

D. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

E. Colors and Textures: Match existing building sills.
F. Accessories: provide all accessories as required for attachment.
   1. Anchors: Type and size indicated, fabricated from [Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666
   2. Dowels: 1/2-inch- (12-mm-) diameter round bars, fabricated from [Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666
   3. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast-stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C 91.
   1. Products: Subject to compliance with requirements, provide one of the following:
      b. Lafarge North America Inc.; Magnolia Masonry Cement.
      c. Lehigh Cement Company; Lehigh Masonry Cement.

E. Mortar Cement: ASTM C 1329/C 1329M. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Davis Colors; True Tone Mortar Colors.
      b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
      c. Solomon Colors, Inc.; SGS Mortar Colors.

G. Colored Cement Product: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
1. Products: Mortar materials are to include a choice of two color pigments mortars at brick veneer masonry walls and unpigmented mortar at painted surfaces. Provide mortar colors from the following:
   c. Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.

H. Aggregate for Mortar: ASTM C 144.

1. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
2. White-Mortar Aggregates: Natural white sand or crushed white stone.
3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

I. Aggregate for Grout: ASTM C 404.

J. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Euclid Chemical Company (The); Accelguard 80.
   c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

K. Water: Potable.

2.7 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420).

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Mill- galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
5. Wire Size for Veneer Ties: 0.148-inch (3.77-mm) diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.. At Security walls/partitions, not more than 8 inches o.c..
7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.
C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

D. Masonry Joint Reinforcement for Multiwythe Masonry:
   1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches (100 mm) wide, plus 1 side rod at each wythe of masonry 4 inches (100 mm) wide or less.
   2. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face.

2.8 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
   3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.

C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire.
   2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire.

D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.
   1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

E. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

   a. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).

2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.

   a. Products: “Basis of Design:
      1) For Stud Wall applications, use CTP-16-1, by Construction Tie Products. Use the WT-42 tie (4" tie) at 16" verticals.
      2) For CMU wall back up applications, use CTP-16-2, by Construction Tie Products. Use the WT-42 (4" tie) fastened to masonry with a #5561022 CTP Masonry Fastener 16x24
   b. Subject to compliance with requirements, provide one of the following:
      1) Hohmann & Barnard, Inc.; SBRA Anchor
      2) Wire-Bond; HCL711 #2411.
   c. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, having slotted holes for inserting wire tie.
   d. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch- (1.90-mm-) thick, steel sheet, galvanized after fabrication.
   e. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire.

F. Anchor Bolts: Headed steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

2.9 EMBEDDED FLASHING MATERIALS

A. Flexible Flashing: Use one of the following unless otherwise indicated:


   a. “Basis of Design” Product: Hyload, Inc.; Hyload Surface Adhered Membrane Flashing System with Drip; Subject to compliance with requirements products will be accepted

      1) Dupont Tyvek Alvaloy Flashing.
      2) Mortar Net “Total Flash”
b. Provide prefabricated pieces at ends, corners, and transitions.

2. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use one of the following unless otherwise indicated:

1. Mesh Weep/Vent: Free-draining honeycomb mesh or tube with screen to allow air movement but prevent insect ingress.

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) Used at all clay masonry conditions:
         a) Hohmann & Barnard, Inc.; #QV – Quadro-Vent. (full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.)

      2) Used at all stone masonry conditions:
         a) Hohmann & Barnard, Inc.; #341S Series Round Plastic Weep with Screen. 4 inch depth (4 inch depth, color to be selected from standard manufacturer's colors).

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

   1. Products: Subject to compliance with requirements, provide one of the following:
a. Mortar Net USA, Ltd.; Mortar Net.
b. Advanced Building Products Inc.; Mortar Break.
c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.

2. Provide one of the following configurations:
   a. Strips, full-depth of cavity and 10 inches (250 mm) high, with dovetail shaped notches 7 inches (175 mm) deep.

2.11 CAVITY-WALL INSULATION

A. Above Finish Floor:
   1. See drawing details and Section 072100 Thermal Insulation.

B. Below Finish floor and at Edge of Slab:
   1. See drawing details and Section 072100 Thermal Insulation.

2.12 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer’s standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Diedrich Technologies, Inc.
      b. EaCo Chem, Inc.
      c. ProSoCo, Inc.

2.13 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

   1. Do not use calcium chloride in mortar or grout.
   2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
   3. For exterior masonry, use portland cement-lime or masonry cement mortar.
   4. For reinforced masonry, use portland cement-lime or masonry cement mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced CMU above grade, use Type S.
3. For Brick, use Type N.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Application: Use pigmented mortar for exposed mortar joints with the following units:
   a. Decorative CMUs.
   b. Pre-faced CMUs.
   c. Concrete facing brick.
   d. Face brick.
   e. Hollow brick.
   f. Glazed structural-clay facing tile.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.
2. Application: Use colored aggregate mortar for exposed mortar joints with face brick.

F. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.
2.14 SOURCE QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:

1. Payment for these services will be made by Owner.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

B. Concrete Masonry Unit Test: For each type of unit furnished, per ASTM C 140.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/4 inch (6 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/4 inch (6 mm).
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/4 inch (6 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.

3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.

4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.

5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).

2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).

3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs. See drawings and elevations for locations of other masonry patterns.

C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

E. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
3.4 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:
   1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
   2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
   3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
   4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:
   1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. (0.25 sq. m) of wall area spaced not to exceed 24 inches (812 mm) o.c. horizontally and 16 inches (406 mm) o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches (305 mm) of openings and space not more than 36 inches (914 mm) apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches (610 mm) o.c. vertically.
      a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
      b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement.
      c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement to allow for differential movement regardless of whether bed joints align.

B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.
1. Provide continuity with masonry-joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

D. Coat cavity face of backup wythe to comply with Division 07 Section “Cold Fluid Applied Waterproofing.

E. Apply weather barrier to face of backup wythe to comply with Division 07 Section “Weather Barriers.”

F. Installing Cavity-Wall Insulation: See drawings and details and Division 07 Section “Thermal Insulation.”

3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 1/2 inch (13 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.8 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections in masonry joints. Provide not less than 1 1/2 inches (38 mm) of air space between back of masonry veneer and face of sheathing.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches (406 mm) o.c. vertically and 16 inches (406 mm) o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. (0.25 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (914 mm), around perimeter.
5. At sloping rowlock sill for masonry openings greater than 48 inches, provide vertical “Z” rod anchors to masonry below at 24” O.C.. Coordinate installation with membrane thru wall flashing.

3.9 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At lintels, corners and sills install prefabricated corners ends dams and flashing accessories in accordance with written requirements of embedded flashing manufacturer.

C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

E. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.10 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.11 MOVEMENT (CONTROL AND EXPANSION) JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

C. Form control joints in concrete masonry as follows:
   1. Install preformed control joint gaskets designed to fit standard sash block.

D. Form expansion joints in brick made from clay or shale as follows:
   1. Build in joint fillers where indicated.
   2. Form open joint of width indicated but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealers." Maintain joint free and clear of mortar.

3.12 SETTING CAST STONE IN MORTAR

A. Install cast-stone units to comply with requirements in Section 042000 "Unit Masonry."

B. Set units in full bed of mortar with full head joints unless otherwise indicated.
   1. Fill dowel holes and anchor slots with mortar.
   2. Fill collar joints solid as units are set.
   3. Build concealed flashing into mortar joints as units are set.
   4. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
   5. Keep joints at shelf angles open to receive sealant.

C. Rake out joints for pointing with mortar to depths of not less than 3/4 inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.

D. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch (10 mm). Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.

E. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.

F. Rake out joints for pointing with sealant to depths of not less than 3/4 inch (19 mm). Scrub faces of units to remove excess mortar as joints are raked.

G. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.
   1. Keep joints free of mortar and other rigid materials.
   2. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."
3.13 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances. If joints are necessary, use sealant filled joints.

1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.

B. Fill anchor holes with sealant.

1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.

C. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.

D. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor’s expense.

B. Inspections: Virginia Uniform Statewide Building Code (VUSBC) “Special Inspections”. Refer to (VUSBC) “Special Inspections” at the end of Section 014000 for required tests.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. The Owner’s independent testing/inspection agency shall inspect the masonry construction during various work stages for compliance with project drawings and specifications, and keep records which cover the following:

1. Quality and testing of masonry units.
2. Proportioning, mixing and consistency of mortar and grout. Laying, mortaring, and grouting of masonry units and elements.
3. Condition, grade, size, spacing and placement of reinforcement.
4. Any significant or unusual construction loads on masonry structural elements.
5. General progress of work
6. When ambient temperature falls below 40 deg F or rises above 100 deg F, a complete record of weather conditions and of preconditioning and protection given to masonry materials and protection and curing of completed work shall be maintained.
7. Inspection records shall be furnished to Building Official, Owner and Architect/Engineer during progress of the work.
8. The Inspector shall not supervise the construction; however, he shall visit the project with the frequency necessary to observe the various stages of work and long enough at each visit to ascertain that it is being done in compliance with the Contract Documents and code requirements. The Inspector shall be present as frequently as he deems necessary to judge whether the quality of the work complies with the Contract Documents; to see that masonry materials are of the correct quality and properly installed; and, to see that tests for quality control are being made as specified.

D. Evaluation of Quality Control Tests and Inspections: In absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality control tests and inspections comply with minimum requirements indicated.

3.15 REPAIRING, POINTING, AND CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
2. Protect surfaces from contact with cleaner.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
3.16 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000
1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Structural steel.
2. Grout.

B. Related Requirements:
1. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications and other steel items not defined as structural steel.
2. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting for surface-preparation and priming requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication of structural-steel components.
   1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.
   3. Include embedment Drawings.
   4. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
   5. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

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

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer and testing agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:
   1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   2. Direct-tension indicators.
   3. Tension-control, high-strength, bolt-nut-washer assemblies.
   4. Shop primers.

F. Survey of existing conditions.
1.8 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

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

1. AISC 303.
2. AISC 360.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.10 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using AISC 360.
2. Use Load and Resistance Factor Design; data are given at factored-load level.

B. Moment Connections: Type FR, fully restrained.

C. Construction: Combined system of moment frame and braced frame.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Channels and Angles: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M.

D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.

E. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

2. Finish: Plain.

B. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.


3. Washers: ASTM F 436, Type 1, hardened carbon steel.


C. Threaded Rods: ASTM A 36/A 36M.


3. Finish: Plain.
2.3 PRIMER

A. Primer: Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

B. Primer: SSPC-Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.

C. Primer: Fabricator's standard lead- and chromate-free, nonasphalhtic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.4 GROUT

A. 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.

2.5 FABRICATION

   1. Fabricate beams with rolling camber up.
   2. Mark and match-mark materials for field assembly.
   3. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."

F. Welded Door Frames: Build up welded door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.
G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened and Slip critical.

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. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 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.
5. Surfaces enclosed in interior construction.

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

1. SSPC-SP 2, "Hand Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

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. Galvanize lintels attached to structural-steel frame and located in exterior walls.

2.9 SPECIAL INSPECTIONS

A. Special Inspections and tests will be performed by the Special Inspector or Special Inspection Agency.

1. Provide access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Verify that the fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and that those procedures are being implemented. This inspection will provide a basis for determination of the fabricator’s ability to conform to approved drawings, project specifications, and referenced standards.

a. Exception: Special Inspections will not be required where the work is done on the premises of a fabricator registered and approved to perform such work without special inspection.

3. Approval shall be based upon review of the fabricator’s written procedural and quality control manuals and periodic auditing of fabrication practices.

4. At completion of fabrication, the fabricator shall submit a certificate of compliance stating that the work was performed in accordance with the approved construction documents.
PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.


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

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. 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 is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened and Slip critical for braced frames.

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

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges." for mill material.

3.5 SPECIAL INSPECTIONS

A. Special Inspections and tests will be performed by the Special Inspector or Special Inspection Agency.

B. Verification and inspection of steel construction shall be in accordance with the requirements of Section 1705.2 of Virginia Construction Code 2012 and as follows:

1. Welding: Welding inspection shall be in compliance with AWSD1.1. In addition to visual inspection, welds may be tested and inspected
according to AWS D1.1/D1.1M and the following inspection procedures, at Special Inspector's option:

a. Liquid Penetrant Inspection: ASTM E 165.

b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

c. Ultrasonic Inspection: ASTM E 164.

d. Radiographic Inspection: ASTM E 94.

2. Details: Perform an inspection of the steel frame to verify compliance with the details shown on the approved construction documents such as bracing, stiffening, member locations and proper application of joint details at each connection.

3. High Strength Bolts: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

   a. General: While Work is in progress, determine that the requirements for bolts, nuts, washers, paint, bolted parts and installation and tightening in such standards are met. For joints required to be tightened only to snug-tight condition, verify that the connected materials have been drawn together and properly snugged.

   b. Periodic monitoring: Joints designated as sung tight need be inspected only on a periodic basis.

C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

D. Additional testing performed to determine compliance of corrected Work with specified requirements shall be at Contractor’s expense.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

B. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

END OF SECTION 051200
SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   2. KCS-type K-series steel joists.

B. Related Requirements:
   1. Section 033000 "Cast-in-Place Concrete" for installing bearing plates in concrete.

1.3 DEFINITIONS

A. SJI’s "Specifications": Steel Joist Institute’s "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

1.4 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.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Welding certificates.
C. Manufacturer certificates.

D. Mill Certificates: For each type of bolt.

1.6 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."

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

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.

1. Use ASD; data are given at service-load level.

PART 2 - PRODUCTS

2.1 K-SERIES STEEL JOISTS


B. Provide holes in chord members for connecting and securing other construction to joists.

C. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

D. Do not camber joists.
2.2 PRIMERS

A. Primer: Provide shop primer that complies with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

2.3 JOIST ACCESSORIES

A. Bridging: 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.

B. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
   1. Finish: Plain, uncoated.

C. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
   1. Finish: Plain.

D. Welding Electrodes: Comply with AWS standards.

E. 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 by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 according to SJI’s "Specifications," joist manufacturer’s written recommendations, 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 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. 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.

3.3 SPECIAL INSPECTIONS

A. Special Inspections and tests will be performed by Special Inspector or Special Inspections Agency.

B. Verification and inspection of steel construction shall be in accordance with the requirements of Section 1705.2 of Virginia Construction Code 2012 and as follows:

1. Welding: Welding inspection shall be in compliance with AWSD1.1. In addition to visual inspection, welds may be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at Special Inspector’s option:
   
a. Liquid Penetrant Inspection: ASTM E 165.
   b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
   c. Ultrasonic Inspection: ASTM E 164.
   d. Radiographic Inspection: ASTM E 94.
2. Details: Perform an inspection of the steel frame to verify compliance with the details shown on the approved construction documents such as bracing, stiffening, member site and locations, and proper application of joint details at each connection.

3. High Strength Bolts: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

   a. General: While work is in progress determine that the requirements for bolts, nuts, washers, and paint bolted parts and installation and tightening in such standards are met. For joints required to be tightened only to snug-tight condition, verify that the connected materials have been drawn together and properly snugged.

   b. Periodic monitoring: Joints designated as sung tight need be inspected only on a periodic basis.

C. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

D. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.4 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 installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists abutting structural steel and accessories.

   1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
   2. Apply a compatible primer of same type as primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100
SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section Includes:
      1. Roof deck.
   B. Related Requirements:
      1. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of deck, accessory, and product indicated.
   B. Shop Drawings:
      1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS
   A. Welding certificates.
   B. Product Certificates: For each type of steel deck.
   C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
      1. Power-actuated mechanical fasteners.
   D. Evaluation Reports: For steel deck.
E. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."


1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1.7 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

PART 2 - PRODUCTS

2.1 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: As indicated.
2.2 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Galvanizing Repair Paint: ASTM A 780.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. 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 in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer’s written instructions.

3.3 ROOF-DECK INSTALLATION

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.
   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 1/2 of the span or [36 inches, and as follows:
   1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.

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. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to 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.
E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 SPECIAL INSPECTIONS

A. Special Inspections and tests shall be performed by the Special Inspector or Special Inspection Agency.

B. Verification and inspection of metal deck construction shall be in accordance with Table 1705.2.2 of Virginia Construction Code 2012, and as follows:

1. Welding: Welding inspection shall be in compliance with AWSD1.3.

2. Details: Perform an inspection of the steel decking to verify compliance with the details shown on the approved construction documents, such as layout, bearing and laps, quantity and spacing of welds and screws.

C. Remove and replace work that does not comply with specified requirements.

D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100
SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Exterior non-load-bearing wall framing.
2. Platform Floor framing. (see Story 111)

B. Related Sections include the following:

1. Division 05 Section “Metal Fabrications” for masonry shelf angles and connections.
2. Division 09 Section “Gypsum Board Shaft Wall Assemblies” for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: For only those items indicated to be designed by the Contractor, provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

   a. Horizontal deflection of L/600 of the span.
   b. Vertical deflection of L/360 of the span.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings (only for items indicated to be designed by the Contractor): Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Additional Delegated Design required to provide framing for tiered seating platform located at room Story 111.


E. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per
ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

F. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: ST33H for 18 and 16 gage studs, ST50H for 14 gage studs and thicker.
2. Coating: G60.

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 50, Class 1 or 2.
2. Coating: G90.

2.2 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated.
2. Flange Width: 1-5/8 inches unless noted otherwise.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As indicated.
2. Flange Width: 1-1/4 inches unless noted otherwise.

C. Vertical Deflection Clips: Manufacturer’s standard bypass or head clips as indicated, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Dietrich Metal Framing; a Worthington Industries Company.
   b. The Steel Network, Inc.
   c. Simpson Strong-Tie

2.3 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer’s standard thickness and configuration, unless otherwise indicated.

2.4 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers.

C. Expansion Anchors: As indicated.

D. Power-Actuated Anchors: As indicated.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer’s standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.
B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer’s standard widths to match width of bottom track or rim track members.

2.6 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI’s specifications and standards, manufacturer’s written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members as indicated.
   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install as indicated, with screw penetrating joined members by not less than three exposed screw threads.
4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members as indicated. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install as indicated, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 07 Section “Thermal Insulation,” in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated.
C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Connect vertical deflection clips to studs and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows not more than 48 inches apart. Fasten at each stud intersection.
   1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
   2. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 ERECTION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.6 FIELD QUALITY CONTROL

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

B. Field and shop welds and mechanical fasteners will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000
SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Miscellaneous steel framing and supports.
   2. Shelf angles.
   3. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section:
   1. Loose steel lintels.
   2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
   3. Steel weld plates and angles for casting into concrete where they are not specified in other sections.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.3 SUBMITTALS

A. Product Data: For the following:
   1. Paint products.
   2. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.
   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500, cold-formed steel tubing.

C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

D. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
   1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm).
   2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33 (Grade 230), with G90 (Z275) coating; 0.108-inch (2.8-mm) nominal thickness.

E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M.

2.3 NONFERROUS METALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.


C. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls.
1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.

B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

D. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.5 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.


E. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.6 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

C. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.

E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 24 inches (600 mm) o.c.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS
A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

2.8 LOOSE BEARING AND LEVELING PLATES
A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.9 LOOSE STEEL LINTELS
A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
B. Galvanize loose steel lintels located in exterior walls.
C. Prime loose steel lintels located in exterior walls with zinc-rich primer.
2.10 STEEL WELD PLATES AND ANGLES
   A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.11 FINISHES, GENERAL
   A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   B. Finish metal fabrications after assembly.

2.12 STEEL AND IRON FINISHES
   A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
   B. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
      3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
   C. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL
   A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
   B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade
surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING BEARING AND LEVELING PLATES


B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

C. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000
SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wood blocking, cants, and nailers.
2. Wood furring and grounds.
3. Plywood backing panels for electrical & communications equipment.

1.2 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative and fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
5. Expansion anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Composite Wood and Agrifiber Products (including treated plywood substrates) installed within the building waterproofing envelope: No added urea formaldehyde resins.

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable
rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish.
3. Provide dressed lumber, S4S, unless otherwise indicated.
4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

C. Wood Structural Panels:
   1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
   2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
   3. Mark panels according to indicated standard.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).

   1. Use Interior Type A, unless otherwise indicated.

B. Products: Subject to compliance with requirements, provide one of the following for Interior
Type A Fire-Retardant-Treated Wood:
1. "D-Blaze," Chemical Specialties, Inc. (CSI)
3. "Pyro-Guard," Hoover Treated Wood Products.

C. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

D. Application: Treat all rough carpentry and items indicated on Drawings, unless otherwise indicated, and the following:

1. Framing for raised platforms.
2. Concealed blocking.
3. Plywood backing panels.
4. Roof blocking.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
5. Furring.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.

2.5 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exterior, AC, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified.
1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.


C. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

PART 3 - EXECUTION

3.1 BLOCKING

A. Provide solid fire retardant treated wood blocking. Blocking is to be securely fastened between metal studs behind wall finish for attachment of all wall mounted hardware, specialties, cabinets or other wall mounted items.

B. It is the responsibility of the Contractor to coordinate locations of blocking and to insure the required blocking is installed before gypsum wallboard or other wall finish is applied. Failure to provide solid wood blocking for wall mounted items will require removal of wall material, installation of proper blocking, reinstallation of wall finish and repair of wall finishes.

3.2 INSTALLATION

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

C. Framing Standard: Comply with AF&PA’s "Details for Conventional Wood Frame Construction," unless otherwise indicated.

D. Do not splice structural members between supports, unless otherwise indicated.

E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000
SECTION 061600 – EXTERIOR SHEATHING

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Wall sheathing.
B. Related Sections
   1. Division 6 “Rough Carpentry”
   2. Division 7 “Thermal Insulation” for continuous insulation product bonded with FRT plywood used at metal panels.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS
A. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated plywood.
   2. Fire-retardant-treated plywood.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Fire-Resistance Ratings: Indicated by design designations from UL’s “Fire Resistance Directory” or from the listings of another qualified testing agency.
2.2 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat all plywood unless otherwise indicated.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are required, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201/D 3201M at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat all plywood unless otherwise indicated.

2.4 WALL SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
1. **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:
   
   a. [Georgia-Pacific Building Products](#).
   b. [National Gypsum Company](#).
   c. [United States Gypsum Company](#).

2. Type and Thickness: Regular, 1/2 inch thick.

3. Use Type X at rated exterior walls and where required by code.

### 2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof parapet and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

### 2.6 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
C. Securely attach to substrate by fastening as indicated and as required by manufacturer, at a minimum complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Coordinate wall, parapet, and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.
   1. Fasten gypsum sheathing to cold-formed metal framing with screws.
   2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
   3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Seal sheathing joints according to sheathing manufacturer's written instructions.
   1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600
SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes architectural woodwork and fabrication for the following:
   1. Interior standing and running trim and framed openings (see details)
   2. Window sills/stools/aprons.
   3. Wood cabinets and hardware
   4. Custom casework and woodwork
   5. Plastic-laminate cabinets
   6. Plastic-laminate countertops
   7. Solid-surfacing-material countertops
   8. Tiered Seating and Shelving combination installation (see Story 111 and details)
   9. Closet and utility shelving
   10. Shop finishing of interior woodwork
   11. Brackets and supports
   12. Speaker holes, grommets, raceway tray, and other accessories

B. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips unless concealed within other construction before woodwork installation.

C. Related Sections include the following:
   1. Division 06 Section “Rough Carpentary” for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed with other construction before woodwork installation.

1.2 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

B. For purposes of this contract, “Architectural Woodwork” includes (1) millwork/casework type items, (2) multi-piece standing and running trim and associated with framed openings, and (3) some specialty work requiring both shop-fabricated and field-assembled high-quality woodwork items. Some of the work could traditionally be considered “finish carpentry;” however because of the special composite construction and generally high quality required, all is considered “architectural woodwork.”
1.3 SUBMITTALS

A. Product Data: For panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, solid-surfacing material, fire-retardant-treated materials, cabinet hardware and accessories, handrail brackets and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sized of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show location and sizes of cutouts and holes for electrical devices, plumbing fixtures, faucets, soap dispensers, in-counter equipment and other items installed in architectural woodwork.
   4. Show veneer leaves with divisions, grain direction, exposed face, and identification numbers indicated the flitch and sequence with the flitch for each leaf.
   5. Apply AWI-certified compliance label to first page of Shop Drawings.

C. Samples:
   1. Lumber with or for transparent finish, not less than 5 inches wide by 24 inches long, for each species and cut, finished on 1 side and 1 edge. Provide up to (5) mockups of stain if required for final color selection and approvals.
   2. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
   3. T-mold (PVC edge) for color selection.
   4. Thermoset decorative panels, for each type, color, pattern, and surface finish.
   5. Solid-surfacing materials, 6 inches square.
   6. Proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality and finish.

D. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

E. Product Certificates: For each type of product, signed by product manufacturer.

F. Qualification Data: For Installer and fabricator.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of woodwork.
B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers.

D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards."

1. The Contract Documents contain selections chosen from options in the quality and standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section “Project Management and Coordination”.

1.5 DELIVER, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operation that could damage woodwork have been competed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in “Project Conditions” Article.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of AWI’s quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Species and Cut for Transparent Finish: White Hard Maple, plain sawn or sliced.

C. Wood Species for Opaque Finish: Any closed-grain hardwood.

D. Wood Products: Comply with the following:

1. Medium-Density Fiberboard: ANSI A208.2, Grade MD made with binder containing no urea formaldehyde.
2. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue with no added urea formaldehyde.
5. Subject to the above requirements, provide products by, but not limited to the following:
   a. Sierra Pine Composite Solutions
   b. Roseburg Skyblend
   c. Panel Source: a Division of McKillican
   d. S.J. Morse
E. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

F. Provide PVC or polyester edge banding complying with LMA EDG-1 on all exposed or semi-exposed edges for laminate countertops.
1. 3mm "T-mold" edging on all laminate countertops.

G. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
   a. Abet Laminati, Inc.
   b. Nevamar Company, LLC; Decorative Products Div.
   c. Wilsonart International; Div. of Premark International, Inc.
2. See "Basis of Design" product and color selection indicated on the drawings and finish schedule/legend.

H. Engineered Stone Solid –surfacing Material: Composite of 94% quartz material and 6% plastic resin complying with ISSFA-2.
1. Manufacturers: "Basis of Design": Silestone, Color Selected by Architect (See "Basis of Design" product and color selection indicated on the drawings and finish schedule/legend
2. Subject to compliance with requirements, equal products of the following will be considered:
   a. Zodiaq; by DuPont.
   b. Cambria
   c. E. I. du Pont de Nemours and Company. ("Corian") (color selected from price groups A-E)

2.2 FIRE-RETARDANT-TREATED MATERIALS
A. General: Fire retardant treated floor platform and like structural framing, and blocking are specified in Division 06 Section “Rough Carpentry”. Where such internal framing is included in the woodwork fabrications, use fire-retardant-treated material as indicated. No actual finish woodwork items (trim, casings, bases, casework panel and worked lumber components etc.) are fire-retardant-treated.

2.3 CABINET AND CASEWORK HARDWARE AND ACCESSORIES
A. General: Provide cabinet hardware and accessory materials associated with architectural woodwork, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."

B. Support Brackets
1. Support Brackets for use at computer work surface counters at Computer 110 and all the Security and Circulation Desks:
   a. Hafele 287.74.305 Speed Brace, Steel, Black, 21” x 24”.
      1) Install one support bracket at 16” O.C. at each stud in adjacent wall.

C. Support Brackets (support for service counter surfaces): Hafele 305 (12”) x 38 (1 1/2”) x 381 (8”) stainless steel, Number 287.74.301 (black)

D. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.
   1. BLUM “module” 170 concealed self closing hinge #91A6500, with #195H7 series mounting plate.
   2. One pair per door to 48 inch height. Two pair over 48 inches in height.

E. Back-Mounted Pulls: BHMA A156.9, B02011, aluminum, Hafele 106.74.90, with inset base

F. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.

G. Catches: Roller catches, BHMA A156.9, B03071. Hafele 245.75.310 black plastic magnetic push catch with Hafele 245.63.291 steel strike

H. Drawer Slides: BHMA A156.9, B05091.
   1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides. BLUM Drawing Runner BS 230E. Epoxy powder coated white color, size as required. Minimum 100 lb load rating.
   2. Box Drawer Slides: Grade 1; for drawers not more than 6 inches (150 mm) high and 24 inches (600 mm) wide.
   3. File Drawer Slides: Grade 1HD-100; for drawers more than 6 inches (150 mm) high or 24 inches (600 mm) wide.
   4. Pencil Drawer Slides: Grade 2; for drawers not more than 3 inches (75 mm) high and 24 inches (600 mm) wide.

I. Tray Drawer Guides: Surface-mounted plastic guides with slot for flat trays. Design standard is Hafele #430.34 series. Mount guides at spacing indicated on Drawings.

J. Keyboard Platform: Retractable platform for standard 20-inch keyboard, with mouse pad (right-hand side) and wrist/palm rest. For Bid purposes, provide the following.
   1. Accuride # CBERGO-TRAY200. (basic unit, foam pad)

K. Door and Drawer Locks: [INCLUDE LOCKS FOR ALL MILLWORK AT WORKROOM 108]
   1. Door Locks: BHMA A156.11, E07121, and Drawer Locks: BHMA A156.11, E07041.
a. High security cam locks.
b. Mounting: Flush
c. Finish: Brushed Chrome
d. Keying: Master keyed as directed by Architect, provide locks on all cabinet doors and drawers, provide two (2) keys per lock.
e. Provide two (2) Hafele bolts #252.01.647 with strike plates at inactive leaf of double door cabinets and storage units.

L. Grommets for Cable Passage through Countertops: 3 inch, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
   1. Product: subject to compliance with requirements, provide “Accuride # CBERGO-TRAY200” by Doug Mockett & Company, Inc.

M. Grommets for Passage of 4 or more Cables through Countertops: 6-1/2" long by 3" wide molded-plastic grommets and matching plastic caps with slot for wire passage and designed to fit into a 6" by 2" oval slot routed into countertop. Textured cap to have 3-1/2" by 1" cord access slot. Provide in black color.
   1. Product: Large Oval # LO3-90 “King Kong” grommet set, consisting of grommet liner and cap with “flip-top” tab by Doug Mockett and Co., Inc. (800) 523-1269 or www.mocket.com.

N. Undercounter Wire Management Troughs: Extruded vinyl channel or trough shapes indicated. Black color and screw-mounting unless noted otherwise. Provide indicated series by Doug Mockett and Co., Inc. www.mockett.com
   1. WM3-90 “Snapper” 2-1/2" high by 1-5/16" deep wire management channel with “hinged” front panel that snaps open and shut to insert and retain data cables. Provide in lengths and locations indicated. Fasten to back wall of counters with No. 8 x 1/2-inch cadmium-plated wood screws at 10-inches o.c.

O. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1. Satin Stainless Steel: BHMA 630.

P. For concealed hardware, provide manufacturer’s standard finish that complies with product class requirements in BHMA A156.9.

Q. Adjustable Shelving Hardware: [located at Closet 108B and Tutor 109].
   1. Manufacturer: Knape & Vogt 82/182 Shelving System
   2. Standards: KV #82
   3. Brackets: KV #182, Black, size as required, reference Architectural drawings for shelf sizes.
   4. Bookends: KV #182BE, Black, provide on (1) at each shelf bracket.
   5. Accessories: Provide matching endcaps, standard locks, shelf locators, and bracket screws.

R. Closet Rods:
1. Rail: Hafele #801.12.205
2. End Support: Hafele #803.52.213
3. Center Rail Support: Hafele #802.02.250

S. Cable Management Tray: Mockett WM2. Mount at underside of all computer counters.

T. Coat Hooks: (locate two in Workroom 108)
   1. Hang Safe Hooks: poly carbonate plastic 1 1/4” by 7 inches, provide #14 x 2 inch stainless steel screws and finishing washers. Locate at south east wall of Program Room 132.
   2. Hewi 842.61.3. Provide on inside surface of all toilet room doors.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: PVA
   1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

E. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

F. Steel Plates & Angles: ASTM A36, shop primed, (field paint in Section 099100). (miscellaneous clips etc.)

   1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

H. FABRICATION, GENERAL

I. General: Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
1. Interior Woodwork Grade: Unless otherwise indicated, provide Premium-grade interior woodwork complying with referenced quality standard.
2. Shop cut openings to maximum extent possible. Sand edges of cutouts to remove splinters and burrs. Seal edges of openings in countertops with a coat of varnish.
3. Install glass to comply with applicable requirements in Division 08 Section "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.
4. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation area.
5. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
6. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site. Provide ample allowance for scribing, trimming, and fitting.
   a. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
   b. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

2.5 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH A.

A. Grade: Premium.
B. Wood Species and Cut: Maple, vertical grain
C. For transparent-finished trim items wider than available lumber, use veneered construction. Do not glue for width.
D. For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.
2.6 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

A. Grade: Premium.

B. Wood Species: Any closed-grain hardwood.

C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

D. Assemble casings in plant except where limitations of access to place of installation require field assembly.

E. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

2.7 PLASTIC-LAMINATE CABINETS:

A. Grade: Grade: Premium, except as noted for drawer construction.

B. AWI Type of Cabinet Construction: As indicated. Flush overlay
   1. Dimension: As indicated.
   2. Tops and bottoms glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals. Minimum 6 dowels each joint for 24 inch deep cabinets and a minimum of 4 dowels each joint for 12 inch deep cabinets.
      a. Tops, bottoms and sides of all cabinets shall be 3/4-inch thick particleboard core.
   3. Cabinet Backs - Semi-exposed: Minimum 3/8-inch thick prefinished particleboard fully captured four sides or 1/2-inch prefinished particleboard full overlay construction. Provide mounting strips per AWI standard.
   4. Cabinet sub-base shall be separate and continuous (no cabinet body sides-to-floor), exterior grade plywood with concealed fastening to cabinet bottom. Sub-base shall be ladder-type construction of individual front, back, and intermediates, to form a secure and level platform to which cabinets attach. Sub-base at exposed cabinet end panels shall be
recessed 1/4 inch from face of finished end, for flush installation of finished base material by other trades.

5. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate as follows:
   a. Horizontal Surfaces Other Than Tops: Grade HGS.
   b. Vertical Surfaces: Grade HGS.
   c. Edges: Grade HGS

6. Materials for Semiexposed Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.


9. Colors, Patterns, and Finishes: As selected by Architect from laminate manufacturer’s full range of solid colors and patterns, matte finish.
   a. Selected by Architect from laminate manufacturer’s full range (standard and premium lines) of product in standard textured finish (fine textured or suede finish). High gloss, heavy textured, metallic, or other special surface products (abrasion-resistant, chemical-resistant) will not be required for use in this project.

10. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

11. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

2.8 PLASTIC-LAMINATE COUNTERTOPS:

1. Quality Standard: Comply with AWI Section 400C requirements for high-pressure decorative laminate countertops. Provide balanced construction for HDPL-faced core panel countertops.
   a. Drawings indicate traditional 3/4-inch core material and 1-1/2-inch built-up counter edge, self-edged with plastic laminate.

2. Grade: Premium.

3. High-Pressure Decorative Laminate Grade: HGS.

4. Colors, Patterns, and Finishes: As selected by Architect from laminate manufacturer’s full range of solid colors and patterns, matte finish.

5. Edge Treatment: PVC T-mold matching laminate in color, pattern, and finish.


7. Core Material at Sinks: Particleboard made with exterior glue.
   a. Use one of the following for countertops containing sinks. No exceptions:
      2) Rodman Industries “Resincore I” particleboard.
      3) SierraPine, Ltd “Medex” MDF.
      4) Shop-sanded exterior grade veneer core plywood, minimum 5-ply, 3/4 inch thickness.
8. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.

B. Engineered Stone Solid Surfacing Material Countertops:

1. Grade: Premium

2. Engineered Stone Material Thickness: 1/2-inch, or as indicated on the drawings.

3. Colors, Patterns, and Finishes: As selected from manufacturer's full range.

4. Fabricate tops in one piece with loose backsplashes for field application. Comply with Engineered Stone material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

5. Fabricate tops with an eased edge.


2.9 CLOSET AND UTILITY SHELVING

A. Grade: Premium.

B. Shelf Material: 3/4-inch thick plain-sliced American Select white maple veneer-faced plywood shelving, conforming to AWI Section 600 for Custom Grade. Provide solid-lumber select white maple edgeband at exposed edges.

C. Field applied finishes are specified in Division 9 Section “Paints.”

1. Shelf Cleats: Panels as indicated with holes to receive clothes rods, of same species and grade indicated above for interior lumber trim for transparent finish.


3. Rod Flanges and Supports: Provide molded steel rod end supports equal to products of Stanley, Ives, etc.

2.10 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished.

B. General: Shop finish transparent-finished interior architectural woodwork at fabrication shop as specified in this Section. Refer to Division 09 Section “Paints” for finishing opaque-finished architectural woodwork.

C. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent-finished items specified to be field finished.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of
plastic-laminate-clad woodwork do not require backpriming when surmounted with plastic laminate, backing paper, or thermoset decorative panels.

D. Transparent Finish:
   1. Grade: Premium Custom:
   2. AWI Finish System: Conversion varnish. (previous AWI edition #TR-4)
   3. Staining: Match approved sample for color.
   4. Wash Coat for Stained Finish: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
   5. Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess. Tint filler to match stained wood.

PART 3 - EXECUTION

3.1 Preparation

A. Before installation, condition woodwork to average prevailing humidity conditions in the installation areas.

B. Before installing architectural woodwork, examine shop fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Install woodwork level, plumb, true, and straight to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm). Shim as required with concealed shims.

C. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

D. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8-inch in 96 inches.

E. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
F. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

G. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

H. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
   1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
   2. Install wall railings on indicated metal railing securely fastened to railing.
   3. Install standing and running trim with no more variation from a straight line than 1/8-inch in 96 inches.

I. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8-inch in 96-inch sag, bow, or other variation from a straight line.
   2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips or through metal backing or metal framing behind wall finish.
   3. Present keys to Owner’s representative. Label keys by room number and casework type. Obtain receipt from Owner and turn over to Construction Manager.

J. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
   1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
   2. Install countertops with no more than 1/8-inch in 96-inch sag, bow, or other variation from a straight line.
   3. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with silicone adhesive.
   4. Caulk space between backsplash and wall with sealant specified in Division 7 Section “Joint Sealants.”
K. Window Stools: Anchor securely by approved concealed method on underside of window stools.
   1. Set window stools in bed of adhesive in color to match window stool finish. Countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
   2. Install window stools with no more than 1/8-inch in 96-inch sag, bow, or other variation from a straight line.
   3. Caulk space between window stools and both window unit and wall jambs with sealant specified in Division 7 Section “Joint Sealants.”

L. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

M. Refer to Division 9 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023
SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Cold-applied, emulsified-asphalt dampproofing.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise indicated.

2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING
   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. APOC, Inc; a division of Gardner Industries.
      2. BASF Corporation; Construction Systems.
      3. Henry Company.
   B. Trowel Coats: ASTM D 1227, Type II, Class 1.
   C. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
   D. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.3 AUXILIARY MATERIALS
   A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

C. Asphalt-Coated Glass Fabric: ASTM D 1668/D 1668M, Type I.

D. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.
   1. Thickness: Nominal [1/8 inch (3 mm)].

PART 3 - EXECUTION

3.1 APPLICATION, GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless otherwise indicated.
   1. Apply dampproofing to provide continuous plane of protection.
   2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

B. Dampproof footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches (150 mm) over outside face of footing.
   1. Extend dampproofing 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
   2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where indicated as "reinforced," by embedding an 8-inch- (200-mm-) wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

C. Dampproof exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch (6 mm) onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
   1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
   2. Lap dampproofing at least 1/4 inch (6 mm) onto shelf angles supporting veneer.
3.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Concrete Foundations and Parged Masonry Foundation Walls: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat.

B. Unparged Masonry Foundation Walls: Apply primer and two brush or spray coats at not less than 1.5 gal./100 sq. ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat.

C. Unexposed Face of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft. (0.5 L/sq. m).

D. Unexposed Face of Masonry Retaining Walls: Apply primer and one brush or spray coat at not less than 1.25 gal./100 sq. ft. (0.5 L/sq. m).

E. Masonry Backup for Brick Veneer Assemblies: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

F. Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

3.3 PROTECTION COURSE INSTALLATION

A. Install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers’ written instructions for attaching protection course.
SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board.
2. Glass-fiber blanket.
4. Mineral-wool semi-rigid insulation board (used at all rated exterior walls)
5. Continuous Insulation Wall Panels - Polyisocyanurate Insulation bonded to Fire Treated Plywood (used as continuous insulation (ci) / substrate for all composite metal panels).

B. Refer to Division 07 Section “Coated Foamed-In-Place Insulation” for insulation and tapered insulation above roof deck.

C. Refer to Division 04 Section “Unit Masonry” for cavity wall accessories and flashing.

1.2 SUBMITTALS

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

B. Product test reports.

C. Research/evaluation reports.

1.3 QUALITY ASSURANCE

A. General:

1. Manufacturer: Obtain primary materials from a single manufacturer regularly engaged in manufacturing air barrier membranes. Obtain secondary materials from a source acceptable to the primary materials manufacturer.

2. Preconstruction Meeting: Convene a minimum of two weeks prior to commencing work of this section. Attendance is required by representatives of related trades including covering materials, substrate materials, and adjacent materials, for proper coordination. Agenda shall include at a minimum:

   a. Review of mock-up
   b. Sequence of Construction.
c. Substrate preparation.
d. Materials approved for use.
e. Compatibility of materials.
f. Installation of adjacent and covering materials.
g. Details and submittal review.

1.4 PROJECT CONDITIONS

A. Temperature: Install insulation within range of ambient and substrate temperatures recommended by manufacturer. Do not apply to damp or wet substrate.

B. Field Conditions: Do not install in snow, rain, fog, or mist. Do not install when the temperature of the substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

1.5 WARRANTY

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide insulation of types and thicknesses as indicated on the drawings and as required to achieve “R” Values indicated.

2.2 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

A. Extruded Polystyrene Board, Type X ASTM C 578, Type X, 15-psi (104-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.


2. 2 inch and R-10 min.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. DiversiFoam Products.
b. Dow Chemical Company (The).
c. Owens Corning.
2.3 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Johns Manville.
3. Owens Corning.
4. Knauf Insulation

B. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
1. R-Values as indicated on drawings. If not indicated, R-19 min.

2.4 MINERAL-WOOL BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Owens Corning.
2. Roxul Inc.
3. Thermafiber.
4. US Fireproofing Rockwool (premium plus)

B. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.5 MINERAL-WOOL BOARD INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Owens Corning.
2. Roxul Inc.
3. Thermafiber.
4. US Fireproofing Rockwool (premium plus)

B. “Basis of Design” Product: Roxul CavityRock MD
1. Location: all rated exterior wall insulation at the brick cavity.

2.6 CONTINUOUS INSULATION WALL PANELS

A. General: Continuous Insulation wall panel, comprised of polyisocyanurate foam board bonded to FRT plywood, to be used behind all composite metal panels as indicated on the drawings.
B. Physical properties (Foam Core):
   1. Compressive Strength: ASTM D 1621; Grade 2, 20 psi (138 kPa) minimum or Grade 3, 25 psi (172 kPa).
   2. Dimensional Stability: ASTM D 2126, 2 percent linear change (7 days).
   3. Moisture Vapor Permeance: ASTM E 96, less than 1 perm (57.5ng/(Pa•s•m²)).
   4. Water Absorption: ASTM C 209, less than 0.1 percent by volume.
   5. Service Temperature: Minus 100 degrees to 250 degrees F (Minus 73 degrees C to 122 degrees C).

C. Fire Retardant Treated Plywood: Flame spread rating of 25 or less when tested in accordance with ASTM E 84.


E. Hunter Panels Xci Ply are a high thermal resistive rigid insulation panel composed of a closed cell polyisocyanurate foam core bonded on one side to a premium performance coated glass facer on one side and fire treated plywood on the other.
   1. Type: ASTM C 1289, Type V:
      a. Grade 2 (20 psi).
      b. Grade 3 (25 psi).
   2. Fire Retardant Treated Plywood Thickness:
      a. 3/4 inch.
   3. Panel Size:
      a. 4 feet by 8 feet (1220 mm by 2440 mm).
   4. Thickness / R Value: based on ASTM C 518 at 75 degrees F (23.9 degrees C)
      a. 2.2 inches (56 mm) / R Value 9.6 with 3/4 inch plywood facing

F. Panel Fasteners:
   1. Fasteners shall be approved Hunter Panel fasteners. Fasteners are a corrosion resistant type with oversized heads. Length of fasteners shall be as recommended by the panel manufacturer.
   2. Hunter Panels recommends Hunter SIP SD (Steel Stud).

2.7 ACCESSORIES

A. Insulation for Miscellaneous Voids:
   1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

B. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.
C. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

1. Adhesives shall have a VOC content of 70 g/L or less

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in from exterior walls.

3.3 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.
3.4 INSTALLATION OF CAVITY-WALL INSULATION

A. General Description: Coordinate installation of insulation will all cavity wall conditions, including but not limited to brick ties, waterproofing membranes, weather-barriers, thru-wall flashing membranes, penetrations of all kinds, etc.

B. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Install continuous 2 inch tape seal at all insulation butt joints to seal properly. Insulation installed without proper tape and seal will be rejected and will be required to be removed and reinstalled. If this required other part of the wall to be removed in order to complete this properly, it will be the Contractor’s responsibility to do so at no additional cost to the Owner.

3.5 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION AS INDICATED

A. Apply insulation units to substrates by method indicated, complying with manufacturer’s written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units, without compromising the overall thickness and performance of the insulation.

B. Glass-Fiber Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   a. Where friction fitting will not hold insulation in place, use manufacturer’s recommendations for installing insulation to hold in place.

3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.6 INSTALLATION OF STOREFRONT WINDOW-WALL INSULATION

A. Mineral Wool Blanket or Board Insulation: Install in cavities where indicated, formed by framing members according to the following requirements:

1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

3.7 INSTALLATION OF CONTINUOUS INSULATION WALL PANELS

A. Install in accordance with manufacturer's instructions.
B. Install over building’s exterior wall sheathing.
C. Coordinate with the installation of the exterior building sheathing and weather barrier systems.
D. Coordinate for location of installation with the location and details for the composite aluminum metal panels.
E. Install in exterior spaces without gaps or voids. Do not compress insulation.
F. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
G. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.
H. Exposed insulation must be protected from open flame and kept dry at all times.
I. Fasten Insulation to substrate. Provide base support for the insulation panels as required for the exterior cladding to be installed over the panels. Exterior cladding must be attached through to the framing as required by the cladding manufacturer. Coordinate with the cladding or wall finish manufacturer for the attachment requirements over insulation panels.
J. Install weather barrier product over insulation panels as specified in Section 072713.

K. Exterior wall insulation is not intended to be left exposed for extended periods of time in excess of 45-60 days without adequate protection. If extended exposure is anticipated all exposed foam surfaces including corners, window and door openings, should be taped with a compatible waterproof tape.

L. Install exterior cladding as recommended by the cladding manufacturer and as specified in other sections of this specification.

END OF SECTION 072100
SECTION 072713 – Weather and Air Barriers

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes weather and air barrier systems for the following applications:
   1. Exterior walls
      a. Self-Adhering water resistive, vapor permeable sheet air barrier systems
      b. Fluid-applied water resistive, vapor permeable air barrier systems (used for misc. CMU wall exposures).
   2. Flexible flashings.

1.2 PERFORMANCE REQUIREMENTS

A. General:
   1. Air barriers shall be capable of performing as a continuous vapor-retarding 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, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

1.3 SUBMITTALS

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

B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, 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.

C. Product certificates.

D. Qualification data.

E. Product test reports.
1.4 QUALITY ASSURANCE

A. 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.

B. Mockups: Before beginning installation of air barrier, build mockups of exterior wall assembly, 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.
   1. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.

C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 SELF-ADHERING WATER RESISTIVE SHEET AIR BARRIER, WALLS

A. Membrane Sheet: a self-adhering reinforced modified polyolefin tri-laminate sheet air barrier membrane for wall construction, specifically designed to be water resistant and vapor permeable.
   1. “Basis of Design”: Henry Company; Blueskin VP 160; Subject to compliance with requirements, equal products that may be incorporated into the Work include the following:
      a. Grace, W. R. & Co. vapor permeable sheet
      b. Vaporshield, “Wrapsheild SA”

2.2 FLUID-APPLIED MEMBRANE AIR BARRIER

A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier synthetic polymer membrane.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Synthetic Polymer Membrane:
         1) Henry Company; Air-Bloc 31.
   2. Membrane Vapor Permeance: Not less than 10 perms (580 ng/Pa x s x sq. m); ASTM E 96.
2.3 AUXILIARY MATERIALS AND FLEXIBLE FLASHINGS

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Provide pre-cut self-adhering membrane for window sill pan flashings, window jambs, headers and door openings prepared and as recommended by the manufacturer of the membrane sheet air barrier system.

C. Primer: Liquid waterborne primer recommended for substrate by manufacturer of air barrier material.

D. Butyl Strip: Vapor-retarding, 30- to 40-mil- (0.76- to 1.0-mm-) thick, self adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive, with release liner backing.

E. Modified Bituminous Strip: Vapor-retarding, 40-mil- (1.0-mm-) thick, smooth-surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.

F. Termination Mastic: Cold fluid-applied elastomeric liquid; trowel grade.

G. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

H. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft. (24 to 32 kg/cu. m) density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

I. Modified Bituminous Transition Strip: Vapor-retarding, 40-mil- (1.0-mm-) thick, smooth-surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.

J. Elastomeric Flashing Sheet: ASTM D 2000, 2BC415 to 3BC620, minimum 50- to 65-mil- (1.3- to 1.6-mm-) thick, cured sheet neoprene with manufacturer's recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.

K. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

L. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as
applicable to joint substrates indicated, Use O. Comply with Division 07 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION: SELF-ADHERING SHEET BARRIERS

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

B. Install membrane sheets according to air barrier manufacturer's written instructions and according to recommendations in ASTM D 6135.
   1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous air barrier sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

C. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.
   1. Prime sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

D. Apply and firmly adhere membrane sheets horizontally over area to receive air barrier sheets. Accurately align sheets and maintain a uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure airtight installation.
   1. Apply sheets in a shingled manner to shed water without interception by any exposed sheet edges.
   2. Roll sheets firmly to enhance adhesion to substrate.

E. Apply continuous modified bituminous sheets over modified bituminous strips bridging substrate cracks, construction, and contraction joints.

F. Install air barrier sheets and auxiliary materials to form a seal with adjacent construction and to maintain a continuous air barrier.

G. 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 as indicated.

H. Wall Openings: Prime concealed perimeter frame surfaces of windows, storefronts, and doors. Apply elastomeric flashing sheet so that a minimum of 3
inches (75 mm) of coverage is achieved over both substrates. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25 mm) of full contact.

I. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

J. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air barrier sheet extending 6 inches (150 mm) beyond repaired areas in all directions.

K. Do not cover air barrier until it has been tested and inspected by manufacturer's representative. Provide letter from manufacturer indicating air barrier is installed in compliance with manufacturer's recommendations.

L. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.2 INSTALLATION: FLUID APPLIED WEATHER BARRIER SYSTEM

A. JOINT TREATMENT

1. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air barrier manufacturer's written instructions.

2. Gypsum Sheathing: Fill joints greater than 1/4 inch (6 mm) with sealant according to ASTM C 1193 and with air barrier manufacturer's written instructions. Apply first layer of fluid air barrier membrane at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air barrier membrane over joint reinforcing strip.

B. TRANSITION STRIP INSTALLATION

1. Install strips, transition strips, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
   a. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
   b. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.

2. Apply primer to substrates at required rate and allow drying. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.

3. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
4. 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 as indicated.

5. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

6. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

7. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply elastomeric flashing sheet so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25 mm) of full contact.

8. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

9. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

10. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

11. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

C. AIR BARRIER MEMBRANE INSTALLATION

1. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

2. Apply air barrier membrane to form a seal with strips and transition strips and to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

3. Apply air barrier membrane within manufacturer's recommended application temperature ranges.

4. Retain one or both paragraphs and subparagraphs below if priming of substrates is required; verify requirements with manufacturer.

5. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.

6. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
7. 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.

8. Retain one of two subparagraphs below. Verify minimum thickness recommended by manufacturers; recommended thickness may vary with substrate.

9. Vapor-Permeable Membrane Air Barrier: 120-mil (3.0-mm) wet film thickness.

10. Retain one or both options in first paragraph below. Most manufacturers overlap membrane to previously placed strip and transition strip; W. R. Grace applies strip and transition strip over cured membrane. Verify manufacturer's current recommendations.

11. Apply strip and transition strip over cured air membrane overlapping 3 inches (75 mm) onto each surface according to air barrier manufacturer's written instructions.

12. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

13. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.3 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. Contractor shall arrange for inspection of air barrier by manufacturer. Manufacturer shall provide a report and final certification that the air barrier is installed correctly and completely per the manufacturer's recommendations and requirements.

C. Tests: Testing to be performed may be determined by Owner's testing agency as follows:
   1. Qualitative Testing: Air barrier assemblies may be tested for evidence of air leakage according to ASTM E 1186, smoke pencil with pressurization or depressurization.

D. Remove and replace deficient air barrier components and retest as specified above.

3.4 PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed to these conditions for more than 30 days.

END OF SECTION 072713
SECTION 074243 - COMPOSITE WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes metal-faced composite wall panels.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal-faced composite wall panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:

1. Wind Loads: Determine loads based on the following minimum design wind pressures:
   a. Uniform pressure of 20 lb/sq. ft., acting inward or outward.

2. Deflection Limits: Metal-faced composite wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/175 of the span at the perimeter and 1/60 of the span anywhere in the panel of the span.

1.3 ACTION SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation layouts of metal-faced composite wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish among factory-, shop-, and field-assembled work.

C. Samples: For each type of exposed finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Exterior elevations, drawn to scale, on which the following items are shown and coordinated with each other.

B. Product test reports.

C. Samples of special warranties.
1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Where indicated, provide metal-faced composite wall panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Preinstallation Conference: Conduct conference at Project site.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal-faced composite wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal-faced composite wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

A. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

1. Surface: Smooth, flat finish.

2. Color: TO BE SELECTED AND COORDINATED FOR COLOR FROM STANDARD AVAILABLE COLORS.

3. Exposed Coil-Coated Finishes:

   a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

B. Panel Sealants: ASTM C 920.

2.2 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, minimum G40 hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.

B. Subgirts: Manufacturer's standard C- or Z-shaped sections 0.064-inch nominal thickness.

C. Zee Clips: 0.079-inch nominal thickness.

D. Base or Sill Angles or Channels: 0.079-inch nominal thickness.

E. Hat-Shaped, Rigid Furring Channels:

1. Nominal Thickness: As required to meet performance requirements.
2. Depth: As indicated and as required to achieve profiles indicated, attachment to structure, and structural performance required.

F. Cold-Rolled Furring Channels: Minimum 1/2-inch- wide flange.

   1. Nominal Thickness: As required to meet performance requirements.
   2. Depth: As indicated and as required to achieve profiles indicated, attachment to structure, and structural performance required.
   3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch.
   4. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

2.3 MISCELLANEOUS MATERIALS

A. Aluminum Extrusions: ASTM B 221.

B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal-faced composite wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.
2.4 METAL-FACED COMPOSITE WALL PANELS

A. General: Provide factory-formed and -assembled, metal-faced composite wall panels fabricated from two metal facings bonded, using no glues or adhesives, to solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system.

1. Fire-Retardant Core: Noncombustible, with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less.


3. Subject to compliance with requirements of “Basis of Design” product, provide one of the following:
   a. Alcan Composites USA Inc.; Alucobond.
   b. Alcoa Inc.; Reynobond.
   c. ALPOLIC, Division of Mitsubishi Chemical America, Inc.; ALPOLIC.

B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- thick, coil-coated aluminum sheet facings.

1. Panel Thickness: Minimum 0.236 inch.
2. Core: Standard.
   a. Color: TO BE SELECTED AND COORDINTATED FOR COLOR FROM STANDARD AVAILABLE COLORS.

C. Attachment System Components:
   1. Formed from extruded aluminum.
   2. Include manufacturer’s standard perimeter extrusions with integral weather stripping, panel stiffeners, panel clips and anchor channels.
   3. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal composite material panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

D. Factory-formed, rout and return fabrication methods. System shall be dry seal with no exposed fasteners or sealant.
2.5 ACCESSORIES

A. Wall Panel Accessories: Provide components required for a complete metal-faced composite wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal-faced composite wall panels unless otherwise indicated.

B. Flashing and Trim: Fabricate flashing materials from 0.040" minimum thickness aluminum sheet provided by panel manufacturer to match the adjacent curtain wall/panel system where exposed. Post-painted spray-applied flashings are not acceptable. Provide a lapstrap under the flashing at abutted conditions and seal lapped surfaces with a full bead of non-hardening sealant. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal-faced composite wall panels.

2.6 FABRICATION

A. General: Fabricate and finish metal-faced composite wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal-faced composite wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

C. Metal-Faced Composite Wall Panels: Trim and square edges of sheets with no displacement of face sheets or protrusion of core material.

1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
2. Fabricate panels with sharply cut edges, with no displacement of face sheets or protrusion of core material.
3. Fabricate panels with panel stiffeners, as required to comply with deflection limits, attached to back of panels with structural silicone sealant or bond tape.
4. Dimensional Tolerances:
   a. Panel Bow: 0.8 percent maximum of panel length or width.
   b. Squareness: 0.25 inch maximum.
D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal-faced composite wall panel manufacturer's written instructions.

B. Coordinate that all exterior building sheathing, continuous insulation wall panels, and weather barrier products are installed properly.

3.2 METAL-FACED COMPOSITE WALL PANEL INSTALLATION

A. Attachment System Installation, General: Install attachment system required to support metal-faced composite wall panels and to provide a complete weathertight wall system, including stand-off brackets, subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

2. Do not begin installation until weather barrier, continuous insulation wall panels, and flashings that will be concealed by composite panels are installed.

B. Track-Support Installation: Provide manufacturer's standard horizontal and vertical tracks that provide support and complete secondary drainage system, draining to the exterior at horizontal joints. Install support system at locations, spacings, and with fasteners recommended by manufacturer. Attach panels to wall by interlocking tracks with perimeter extrusions attached to wall panels. Fully engage integral gaskets and leave horizontal and vertical joints with open reveal.

1. Attach routed-and-returned flanges of wall panels to perimeter extrusions with manufacturer's standard fasteners.

2. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.

3. Install according to manufacturer's "Dry-Seal" recommendations. Do not apply sealants to joints unless otherwise indicated on Drawings.
3.3 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weather-tight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal-faced composite wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal-faced composite wall panel units within installed tolerance of 1/4 inch in 20 feet, nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal-faced composite wall panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal-faced composite wall panel installation, clean finished surfaces as recommended by panel manufacturer. Maintain in a clean condition during construction.

B. After metal-faced composite wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

END OF SECTION 074243
SECTION 075700 – COATED FOAMED ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY

A. Section Includes:
   1. Spray-applies, polyurethane foam insulation
   2. Elastomeric roof coatings
   3. Walkways (additional coating layers).
   4. Coverboards
   5. Tapered and foam board roof insulation
   6. Vapor Retarder

1.3 PERFORMANCE REQUIREMENTS

A. Watertightness: Provide coated foamed roofing that is watertight and will not permit the passage of water.

B. Material Compatibility: Provide polyurethane foam, elastomeric coatings, and miscellaneous roofing materials that are compatible with one another and able to bond to substrate under conditions of service and application required, as demonstrated by coated foamed roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide a coated foamed roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to SEI/ASCE 7 and with requirements of IBC: Section 1507.

D. Energy Performance: Provide roofing system with Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Attendees shall include but not be limited to the subcontractors for roofing, composite metal panels, sheet metal flashing, the Architect, and Owner.
1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer’s written instructions for evaluating, preparing, and treating substrate; technical data; and testing physical and performance properties.

B. Manufacturer Certificates:


   a. Submit evidence of compliance with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Samples for Verification: For coated foamed roofing, prepared on Samples of size indicated below:

   1. Samples, 24 by 24 inches (600 by 600 mm), on rigid backing, showing polyurethane foam of thickness required and stepped coatings in colors required to illustrate buildup of coated foamed roofing.

D. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

   1. Layout and thickness of entire roof assembly insulation and components.
   2. Base flashings and terminations.
   3. Flashing details at penetrations and roof drains and scuppers.
   4. Tapered insulation thickness and slopes, and coordination with roof drains and roof mounted equipment.
   5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
   6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
   7. Tie-in with air barrier.

E. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

F. Qualification Data: For SPFA-qualified Installer and applicators.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for coated foamed roofing.

H. Field Quality-Control Reports
I. Maintenance Data: For coated foamed roofing to include in maintenance manuals.

J. Warranty: Sample of special warranty

1.6 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who is approved, authorized, or licensed by roof coating manufacturer for installation of manufacturer’s product over polyurethane foam.
   1. Engage an installer who participates in and who has fulfilled requirements of the SPFA Accreditation Program for company accreditation and individual applicator accreditation for personnel to work on Project.
   2. Roofing applicator must exhibit 10 years and a minimum of 1,000,000 sf experience with the selected roofing system, with projects of a similar scope and nature. The roofing applicator must present documentation that he has successfully completed the SPF Chemical Health and Safety Training Program as provided by The American Chemistry Council.

B. Testing Agency Qualifications: Qualified according to Division 01 Section “Quality Requirements” for testing indicated.

C. Source Limitations: Obtain polyurethane foam and coating materials from single source or producer.

D. The roofing applicator shall perform the work of this section. Subcontracting installation of the silicone coating/polyurethane foam is not allowed.

E. Fire-Test-Response Characteristics: Provide coated foamed roofing systems with fire-test-response characteristics indicated, as determined by testing identical systems per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
   1. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes of 75 and 450, respectively; ASTM E 84.
   2. Exterior Fire-Test Exposure: ASTM E 108; Class A.

F. Comply with recommendations in NRCA’s “Quality Control Guidelines for the Application of Spray Polyurethane Foam Roofing.”

H. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to coated foamed roofing including, but not limited to, the following:
      a. Structural load limitations.
      b. Construction schedule. Verify availability of materials, Installer’s personnel, equipment, and facilities needed to make progress and avoid delays.
      c. Certifying procedures.
      d. Surface preparation specified in other Sections.
      e. Substrate condition and pretreatment.
      f. Minimum curing period.
      g. Forecasted weather conditions.
      h. Special details and sheet flashings.
      i. Installation procedures.
      j. Testing and inspection procedures.
      k. Protection and repairs.
      l. Tie in to existing roofing.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original containers with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, shelf life, and directions for storing and mixing with other components.

B. Store materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by manufacturer. Protect stored materials from direct sunlight.

C. Remove and replace material that cannot be applied within its stated shelf life.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install coated foamed roofing until roof openings, curbs, and parapets, if any, are complete and roof drains, vents, and other roof preparations are in place.

B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing work to be performed according to coated foamed roofing manufacturer’s written instructions and warranty requirements.
   1. Apply materials within the range of ambient and substrate temperatures recommended by roofing material manufacturers, but not below 50 deg F (10 deg C)
2. Apply materials within range of relative humidity recommended by manufacturer of each component, but not when relative humidity exceeds 85 percent, nor when temperatures are less than 5 deg F (3 deg C) above dew point.
3. Do not apply materials to damp or wet surfaces.
4. Do not apply primers, polyurethane foam, or coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application or curing period.
5. Do not apply polyurethane foam when wind conditions result in surface finish textures not complying with requirements.
6. Do not apply coatings when wind conditions prevent uniform coating application.
   a. When wind speeds exceed 10 miles per hour or adversely affects the quality of the SPF, windscreens shall be used during the application of the polyurethane foam and coatings to prevent overspray onto surfaces not intended to receive foam and coating. Under no circumstances shall the polyurethane foam or silicone coating be applied when wind speeds exceed 25 miles per hour.

C. Work on Existing Roof: Work shall be undertaken in a manner not to void the Owner's warranty.
1. When existing roofing is required to be repaired or penetrated, no more roofing shall be disturbed in one day than can be repaired/replaced in the same day. This applies to areas to receive the installation of roof top equipment, vents, and roof fans.
2. Any damage to interior of building due to the Contractor providing inadequate protection shall be repaired using like materials at no cost to Owner. Exposed roof deck shall never be left unprotected over night.
3. Flashing for openings in and closing-up of openings in the existing roofing shall be made only by an approved roofing contractor, using only approved materials and flashing details, as required by the existing roofing manufacturer. Such openings shall be constructed and flashed in such a manner that the terms, conditions, and limitations of the Owner's existing roof warranty, in not violated. Verify roof warranties with Owner.

1.10 SEQUENCING AND SCHEDULING

A. The spray polyurethane foam and coating is installed when the deck, tapered insulation, coverboard, parapet walls, rough openings, and curbs are completed. Plumbing vents, drains, and electrical penetrations should all be in place. There should not be any tradespeople working on the roof when the spray polyurethane foam and silicone coating are being installed.
1.11 WARRANTY

A. Special Warranty: Coated foamed roofing manufacturer’s standard form in which manufacturer agrees to repair or replace coated foamed roofing that does not comply with requirements or that does not remain watertight within specified warranty period.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 POLYURETHANE FOAM

A. Polyurethane Foam: Rigid cellular polyurethane, spray applied, produced by the catalyzed chemical reaction of polyisocyanates with polyhydroxyls, with stabilizers, fire retardants, and blowing agents added; and complying with ASTM C 1029, Type III, as certified by a qualified independent testing agency.

B. “Basis of Design” product BASF Elastospray 81285 and 81305
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BASF Corporation.
   b. Conklin Company Inc.
   c. ERSystems, Inc.
   d. Foam Enterprises LLC.
   e. Gaco Western Inc.
   f. HydroSeal Polymers, Inc.
   g. National Coatings Corporation.
   h. Neogard; Div. of Jones-Blair Company.
   j. Polythane Systems, Inc.
   k. SWD Urethane Company.
   l. UCSC.
   m. Volatile Free, Inc.
2. In-Place Density: 2.8 to 3.0 lb/cu. Ft. (44.9 to 48.1 kg/cu. M); ASTM D 1622.
3. Compressive Strength, psi. min.: 50 psi per ASTM D1621
4. Closed Cell Content, percent min.: >90% per ASTM D2856
5. K-factor, aged, max: 0.158, per ASTM C518
6. Dimensional Stability, 28 days, percent volume change, max.: +0.69, per ASTM D2126
7. Surface-Burning Characteristic: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 75 or less
2.2 SILICONE COATINGS

A. Silicone Coatings: Liquid silicone elastomeric coating system, complying with ASTM D 6694 and specifically formulated for coating spray polyurethane roofing.

B. “Basis of Design” product BASF Eleatocoat S-5001
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. BASF Corporation.
      b. ERSystems, Inc.
      c. Everest Coatings, Inc.
      d. Foam Enterprises LLC.
      e. GE Silicones; Div. of General Electric Company.
      f. Neogard; Div. of Jones-Blair Company.
      g. North Carolina Foam Industries; Div. of Barnhardt Mfg. Co.
      h. UCSC.
      i. United Coatings.
   2. Base-Coat and Topcoat Composition: One- or two-component silicone.
   4. Topcoat Color at Walkways: Gray.
   5. Permeance (as cured): Minimum 5.0 perms (286 ng/Pa x s x sq. m) at 20 mils (0.5 mm) thick per ASTM E 96.
   7. Tensile Strength (as cured): 350, per ASTM D412.
   8. Temperature Stability Range, °F (as cured): -35° to 212°.

2.3 SEALANT

A. Sealant shall be a pigmented silicone sealant such as Dow Corning® Contractors Weatherproofing Sealant (see Section “Joint Sealants”). The color of this sealant, if exposed, shall closely match that of the topcoat.
   1. The roof applicator shall install the roof coating with a V-Groove at the roof edge gravel stop and flashing to receive continuous bead of sealant as recommended by the roof coating manufacturer.

2.4 SUBSTRATE BOARD

A. Thermal Barrier: Glass-mat, water-resistant gypsum board, ASTM C 1177/C 1177M, 1/2 inch (16 mm), Type X.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following
      a. G-P Gypsum Corporation; Dens-Deck.
B. Thermal-Barrier Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FMG 4470, and designed and sized for fastening thermal barrier to substrate.

2.5 TAPERED AND BASE ROOF INSULATION BOARD

A. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, glass-fiber mat facer on both major surfaces.


2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Atlas Roofing Corporation
   b. Carlisle SynTec Incorporated.
   c. Firestone Building Products.
   d. GAF.
   e. Johns Manville; a Berkshire Hathaway company.

3. Size: 48 by 96 inches (1219 by 2438 mm).

4. Thickness:
   a. Base Layer: 1-1/2 inches (38 mm).
   b. Upper Layer: as required for tapered insulation
   c. Minimum thickness: 3-inches.

B. Tapered Insulation: Provide factory-tapered insulation boards.

1. Material: Match roof insulation.
3. Slope:
   a. Roof Field: 1/4 inch per foot (1:48) unless otherwise indicated on Drawings.
   b. Saddles and Crickets: 1/2 inch per foot (1:24) unless otherwise indicated on Drawings.

2.6 INSULATION ACCESSORIES

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
B. Insulation Adhesive: Insulation manufacturer’s recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
   1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.

2.7 AUXILIARY MATERIALS

A. Primer: Polyurethane foam manufacturer’s standard factory-formulated primer.

B. Reinforcement: Flexible polyester or fiberglass mat of weight, type, and composition recommended by roof coating manufacturer for embedment in liquid coating.

C. Sealant: ASTM C 920, Class 25, Use NT, Grade NS, Type S, one-component, neutral- or acid-curing silicone, and as recommended by coated foamed roofing manufacturer for substrate and joint conditions and for compatibility with roofing materials.

D. Sheet Flashing and Accessories: Types recommended by coated foamed roofing manufacturer, provided at locations indicated and as recommended by coated foamed roofing manufacturer.

E. Fiber Cant Strips: Provide fiber cant strips, if required, which are acceptable to coated foam roof system manufacturer.

2.8 GRANULES

A. Granules shall be number 11 screen size, ceramic-coated roofing granules as manufactured by the Industrial Products Division of 3M Company or equal, color to best match topcoat.

B. Quartz or silica aggregate such as Kafka Quartz granules, this product will have natural color variations, color should be selected to match topcoat.

2.9 Protective Covering / Walkways

A. As required a weather-resistant, breathable, resilient pad composed of synthetic rubber strands shall be installed to create additionally protected roof areas. This product shall be approved by the roof coating manufacturer. Such a walkway is Yellow Spaghetti, as manufactured by Western Plastics, Inc.
2.10 VAPOR RETARDER

A. Provide a 3-ply laminate combining two layers of high-density polyethylene and a high-strength cord grid.

B. Property | ASTM | U.S. Value
--- | --- | ---
C. Weight | D-751 | 41.5 LB/1000 FT²
D. 3" Tensile Strength | D-882 | 140 LBF
E. Puncture Strength | D-4833 | 55 LBF
F. PPT Resistance | D-2582 | 42 LBF
G. Dart Impact Strength | D-1709 | 1.25 LBS
H. Cold Impact Strength | D-1790 | -40°F
I. Permeance | E-96 | 0.038 Grain/Hr•Ft²•in.Hg


1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Reef Industries, Inc.
   b. Raven Industries, Inc.
   c. Insulation Solutions, Inc.

K. Accessories
   1. Mastic Tape: Griffolyn® Fab Tape. RI Part Number: 60-0002.
      a. Description: Black, double-sided, asphaltic, pressure-sensitive, mastic tape.
      b. Weight: 3.75 pounds per 100 feet (1.7 kg per 30 m).
      c. Thickness: 35 mils (0.9 mm).
      d. 3 Inch Seam Shear: 35 pounds (156 N).
      a. Description: Reinforced white backing with Gray Adhesive.
      b. Weight: 3.0 lbs for 4 inch x 50 foot roll.
      c. Thickness: 26 mils (0.65 mm).
      d. 3 inch Seam Shear: 30 lbs (134 N)
   3. Pipe Boots: Griffolyn® pipe boots, factory-fabricated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which coated foamed roofing will be applied, with installer present, for compliance with requirements. Begin installation only after unsatisfactory conditions have been corrected and substrates are dry.
3.2 VAPOR RETARDER

A. Install reinforced vapor retarders in accordance with manufacturer's instructions.

B. Install vapor retarders continuously at locations on roof deck as indicated on the drawings. Ensure there are no discontinuities in vapor retarder at seams and penetrations.

C. Install vapor retarders in largest practical widths.

D. Ensure surface beneath vapor retarder is smooth with no sharp projections.

E. Join sections of vapor retarder and seal penetrations in vapor retarder with mastic tape. Ensure vapor retarder surfaces to receive mastic tape are clean and dry.

F. Immediately repair holes in vapor retarder with self-adhesive repair tape.

G. Seal around pipes and other penetrations in vapor retarder with pipe boots in accordance with manufacturer's instructions.

H. Protect reinforced vapor retarders from damage until covered by roof insulation.

I. Immediately repair damaged vapor retarder in accordance with manufacturer's instructions.

3.3 POLYISO AND TAPERED INSULATION BOARD INSTALLATION

A. General:
   1. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
   2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing. Retain paragraph below when air barriers are part of Project. Drawing details should specifically illustrate transition between different air barrier components.

B. Installation:
   1. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
   2. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
   3. Installation Over Metal Decking:
a. Install base layer of insulation with joints staggered not less than 24 inches (610 mm) in adjacent rows end joints staggered not less than 12 inches (305 mm) in adjacent rows and with long joints continuous at right angle to flutes of decking.

1) Locate end joints over crests of decking.
2) Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
3) Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
4) Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
5) At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).
   a) Trim insulation so that water flow is unrestricted.
6) Fill gaps exceeding 1/4 inch (6 mm) with insulation.
7) Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
8) Loosely lay base layer of insulation units over substrate.
9) Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
   a) Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
   b) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.

b. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation.
   1) Staggered end joints within each layer not less than 24 inches (610 mm) in adjacent rows.
   2) Install with long joints continuous and with end joints staggered not less than 12 inches (305 mm) in adjacent rows.
   3) Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   4) Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
   5) At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).
   6) Trim insulation so that water flow is unrestricted.
   7) Fill gaps exceeding 1/4 inch (6 mm) with insulation.
   8) Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
9) Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
   a) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3.4 SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
   1. Fasten thermal barrier to top flanges of steel deck according to recommendations in FMG’s “Approval Guide” for specified Windstorm Resistance Classification.
   2. Fasten board to top of polyiso-tapered insulation board with screws through to steel deck to resist uplift pressure at corners, perimeter, and field of roof according to coated foamed roofing manufacturer’s written instructions.
   3. Install board according to coated foamed roofing manufacturer’s written instructions. Space fasteners for wind-uplift conditions at Project site.

3.5 SURFACE PREPARATION

A. Clean and prepare substrate according to coated foamed roofing manufacturer’s written instructions. Provide clean, dust-free, dew-free, and dry substrate for coated foamed roofing application.

B. Remove grease, oil, form-release agents, curing compounds, and other contaminants from substrate.

C. Cover and mask adjoining surfaces not receiving coated foamed roofing to prevent overspray or spillage affecting other construction. Close off roof drains, removing roof-drain plugs when no work is being done or when rain is forecast.
   1. Remove masking after polyurethane foam application and remask adjoining substrates before coating.

D. Prime substrate if recommended by coated foamed roofing manufacturer.

E. Fill, cover, or tape joints and cracks in substrate that exceed a width of ¼ inch (6 mm). Remove dust and dirt from joints and cracks before applying polyurethane foam.

F. Install vapor retarder according to coated foamed roofing manufacturer’s written instructions.
3.6 POLYURETHANE FOAM APPLICATION

A. General: Mix and apply polyurethane foam according to ASTM D 5469 and coated foamed roofing manufacturer’s written instructions.
   1. Fill irregularities and areas of ponding.
   2. Apply the required full thickness of polyurethane foam in any specific area on same day.
   3. Apply only the area of polyurethane foam that can be covered on same day with required base coating.
   4. Apply polyurethane foam to avoid overspray beyond immediate area of work.

B. Apply polyurethane foam in life thickness not less than 1/2 inch (13 mm) and not more than 1-1/2 inches (38 mm).

C. Uniformly apply total thickness of polyurethane foam indicated, but not less than 1 inch (25 mm), to a surface tolerance of plus 1/4 inch (6 mm) and no minus.

D. Apply polyurethane foam to roof penetrations, terminations, and vertical surfaces as indicated. Unless otherwise indicated, extend polyurethane foam at least 4 inches (100 mm) above elevation of adjacent roof field.

E. Surface Finish: Provide finished surface of polyurethane foam within the following range of surface textures as defined by ASTM D 5469.
   1. Texture: Smooth to orange peel

F. Remove and replace polyurethane foam not complying with minimum surface-texture limitations. Remove defective thickness and prepare and reapply polyurethane foam with acceptable, uniform results.

3.7 COATING APPLICATION

A. Allow polyurethane foam substrate to cure for a minimum of two hours and remove dust, dirt, water, and other contaminants before applying coating.

B. Apply coating system to polyurethane foam in two or more coats and according to roof coating manufacturer’s written instructions, by spray, roller, or other suitable application method.

C. Apply base coat and one or more topcoats to obtain a uniform, seamless membrane free of blisters and pinholes. Apply each coat at right angles to preceding coat, using contrasting colors for successive coats.
   1. Apply base coat on same day as polyurethane foam is applied and allow it to cure.
   2. Apply topcoat(s) after removing dust, dirt, water, and other contaminants from base coat.
3. Silicone Coating: Apply base coat and topcoat to a minimum dry film thickness recommended by coated foamed roofing manufacturer.

D. Apply coating system at wall terminations and vertical surfaces to extend beyond polyurethane foam by 4 inches (100 mm), minimum.

E. Sealant: Apply sealant to perimeter and other terminations where indicated or required by coated roofing manufacturer.

F. Walkways (Walkway Pads): Install roof walkways in pattern and locations indicated. Mask off completed roof coating adjacent to walkways and apply one additional topcoat to achieve a minimum dry film thickness recommended by coated foamed roof manufacturer. Lay reinforcing fabric into wet coating and apply another topcoat, completely filling fabric. Spread mineral granules uniformly at a rate of 0.5 lb./sq. ft (2.45 kg/sq. m) into final wet coating. Remove masking and excess granules after top coat has cured.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
   1. Testing agency will identify, seal, and certify samples of materials taken from Project site, with Contractor present.
   2. Testing agency will perform tests for any product characteristics specified or cited in coated foam roofing manufacturer’s product data.
      a. 2 core samples will be required for roof areas up to 10,000 sq. ft. (929 sq. m), and 1 core sample will be required for each additional 10,000 sq. ft. (929 sq. m) or part thereof.
      b. Slit-test samples will be taken to determine number of coats applied and dry film thickness of coating.

B. Correct deficiencies in, or remove, foam or coatings that do not comply with requirements; fill and repair substrates and reapply materials.

C. Additional testing, at Contractor’s expense, will be performed to determine compliance of corrected Work with requirements.

D. Refill cores, repair slits, and recoat test areas.

3.9 REPAIR AND RECOATING

A. Repair and recoat coated foamed roofing according to ASTM D 6705 and coated foam roofing manufacturer’s written instructions.
3.10 CURING, PROTECTING, AND CLEANING

A. Cure coatings according to coated foam roofing manufacturer’s written instructions, taking care to prevent contamination and damage during application stages and curing. Do not permit traffic on uncured coatings.

B. Protect coated foamed roofing from damage and wear during remainder of construction period.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

D. Replace any adjacent finish materials that have received damage due to overspray or the application process, that can’t be cleaned completely of overspray or damage, including but not limited to, marks, scratches, deformations, dents, etc.

END OF SECTION 075700
SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Manufactured reglets and counterflashing.
   2. Formed low-slope roof sheet metal fabrications.
   3. Formed wall sheet metal fabrications.

1.2 RELATED SECTIONS:

   A. Division 07 Section "Coated Foamed Roofing System"
   B. Division 07 Section "Metal Composite Material Wall Panels".
   C. Division 08 Section "Aluminum Storefront"

1.3 SUBMITTALS

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

   B. Shop Drawings: Show installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.

      1. Include details for forming, joining, supporting, and securing sheet metal flashing and trim, including pattern of seams, termination points, fixed points, expansion joints, expansion-joint covers, edge conditions, special conditions, and connections to adjoining work.

         a. Submittal Details shall include the following:

            1) Identification of material, thickness, weight, and finish for each item and location in the project.
            2) Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions. Details shall be drawn full scale.
            3) Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
            4) Details of termination points and assemblies included fixed points.
5) Details of expansion joints and expansion joint covers, including showing direction of expansion and contraction.
6) Details of edge condition, including eaves, ridges, valleys, rakes, crickets, and counter flashings as applicable.
7) Details of major counter-flashing, copings, and trim/fascia units.
8) Details of special conditions.
9) Details of connection to adjoining work.

C. Maintenance data.

D. Samples: For each exposed product and for each color and texture specified.

E. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

B. Copper Sheet Metal Standard: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups of all flashing conditions, including built-in gutter, fascia trim apron flashing, drip edge flashing conditions, wall flashing conditions, standing and flat seam panels, including supporting construction cleats, seams, attachments, underlayment, and accessories.

D. Manufacturer of visible sheet metal flashing and trim must be supplier of composite metal panel, and color of metal flashing and trim must match composite metal panel.

1. Build mockup of typical roof edge, including fascia, approximately 10 feet (3.0 m) long.

E. Preinstallation Conference: Conduct conference at Project site.

1.5 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.

1. Exposed Coil-Coated Finishes:

a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.

1. Color: Color: To match exactly the color provided for the composite metal panel.

a. Concealed Finish: Pretreat with manufacturer’s standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mill (0.013 mm).
2.3 UNDERLAYMENT MATERIALS

A. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F (111 deg C); and complying with physical requirements of ASTM D 226/D 226M for Type I and Type II felts.

1. 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:
   b. Intertape Polymer Group.
   c. Kirsch Building Products, LLC.
   d. SDP Advanced Polymer Products Inc.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
   a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
   b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
   c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.

C. Solder:

1. For Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
2. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
3. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 MANUFACTURED REGLETS

A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.

1. Material: Aluminum, 0.024 inch (0.61 mm) thick.
2. Finish: To match metal flashing.

2.6 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Obtain field measurements for accurate fit before shop fabrication.
2. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
3. Conceal fasteners and expansion provisions. Exposed fasteners are not allowed on faces exposed to view.
B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
   2. Use lapped expansion joints only where indicated on Drawings.

C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

G. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Cap:
   1. Interlocking multi-part gravel stop fascia system: Provide premanufactured fascia system (field fabricated not acceptable) consisting of formed 0.050 inch aluminum fascia of profile indicated, with “Snap-on” design, minimum 20 gage zinc-coated steel anchor plates, and concealed splice plates. Provide prefabricated inside and outside corners, miters welded before finishing; without exposed fasteners. Provide roof edge system tested in accordance with ANSI/SPRI/FM 4435/ES-1 Standard to comply with the International Building Code. “Basis of Design” standard is Metal-Era Perma-Tite System 200 Fascia.
      a. Color to be provided to match the selected composite aluminum metal panels.

B. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.
   1. Fabricate from the Following Materials:
a. Aluminum: 0.050 inch (1.27 mm) thick.

C. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Aluminum: 0.040 inch (1.02 mm) thick.

D. Counterflashing and Flashing Receivers: Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.

E. Roof and Roof to Wall Transition Expansion-Joint Cover Assemblies
   1. Aluminum: 0.050 inch (1.27 mm) thick.

F. Roof Scuppers: Shop fabricate roof scuppers. Fabricated from the following materials:
   1. Aluminum: 0.050 inch (1.27 mm) thick.

G. Roof-Pentration Flashing: Fabricate from one of the following materials:
   1. Copper: 16oz/sqft (0.55 mm thick)
   2. Stainless Steel: 0.019 inch (0.48 mm) thick.

H. Roof Drain Flashing: Fabricate from the following materials:
   1. Copper: 12oz/sqft (0.41 mm thick)
   2. Stainless Steel: 0.016 inch (0.40 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
   1. Verify compliance with requirements of installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 UNDERLAYMENT INSTALLATION

A. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement so that completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

5. Install sealant tape where indicated or required by manufacturer.

6. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

2. Use lapped expansion joints only where indicated on Drawings.
D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as shown and as required for watertight construction.

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

H. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
C. Copings: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated.

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch centers.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 4 Section "Unit Masonry Assemblies."

C. Reglets: Installation of reglets is specified in Division 4 Section "Unit Masonry Assemblies."

D. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8 inch offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer’s written installation instructions.

D. Provide protection of all sheet metal flashings during construction, and in particular during the foamed-in-place roofing installation.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200
SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.

1.2 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814:

   1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
   2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
      a. Penetrations located outside wall cavities.
      b. Penetrations located outside fire-resistance-rated shaft enclosures.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

   1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
   2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

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

B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item.

1. Engineering Judgements: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

C. Samples: For each kind and color of joint sealant required.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.

E. Qualification Data: For Installer.

F. Warranties

1.4 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.
1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Installation Responsibility: Assign installation of through-penetration firestop systems in Project to a single qualified installer.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.

D. Specific through-penetration firestop systems are indicated on drawings prepared by mechanical, electrical and plumbing design professionals. Through-penetration firestop systems are to be identical to those indicated on the drawings and tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems bearing classification marking of qualified testing and inspecting agency.

E. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

F. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.

2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

   a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
1) UL in its "Fire Resistance Directory."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
   a. 3M Fire Protection Products.
   b. Hilti, Inc.
   c. Tremco, Inc.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.

1. **Sealant shall have a VOC** content of 250 g/L or less.

E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine substrates and conditions, with installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

D. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor’s name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer’s name.
6. Installer’s name.

3.3 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION 078413
SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Joints in or between fire-resistance-rated constructions.
   2. Head-of-wall joints.
   3. Wall-to-wall joints.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.

B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities indicated as determined by UL 2079.
   1. Load-bearing capabilities as determined by evaluation during the time of test.

C. Perimeter Fire-Resistive Joint Systems: For joints between edges of fire-resistance-rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated below and those indicated in the Fire-Resistive Joint System Schedule at the end of Part 3, as determined by NFPA 285 and UL 2079.
   1. UL-Listed, Perimeter Fire-Containment Systems: Integrity ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.

D. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

C. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.

D. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1. Where Project conditions require modification to a qualified testing agency’s illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer’s fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer’s written recommendations.

B. Product test reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, “Approval of Firestop Contractors,” or been evaluated by UL and found to comply with UL’s “Qualified Firestop Contractor Program Requirements.”

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.

C. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 “Performance Requirements” Article:
1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistant joint systems acceptable to authorities having jurisdiction.

2. Fire-resistant joint systems are identical to those tested per methods indicated in Part 1 “Performance Requirements” Article and comply with the following:
   a. Fire-resistant joint system products bear classification marking of qualified testing and inspecting agency.
   b. Fire-resistant joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fire-resistant joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials for fire-resistant joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistant joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistant joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate fire-resistant joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistant joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistant joint systems.
PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Ratings determined per ASTM E 1966 or UL 2079:

1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
2. Manufacturers: Subject to compliance with requirements, fire-resistive joint systems that may be incorporated into the Work include, but are not limited to, those systems indicated on Drawings that are produced by one of the following manufacturers:
   a. Grace Construction Products.
   b. Hilti, Inc.
   c. Nelson Firestop Products.
   d. NUCO Inc.
   e. RectorSeal Corporation.
   f. Specified Technologies Inc.
   g. 3M Fire Protection Products.

C. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

D. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

E. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.
2.2 FIRE-RESISTIVE JOINT SYSTEMS

A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

B. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Part 1 “Performance Requirements” Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer’s written instructions and the following requirements:
   1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
   2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer’s recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible.
without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

3.3 INSTALLATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. General: Install fire-resistive joint systems to comply with Part 1 “Performance Requirements” Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.

C. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

D. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.
3.5 FIELD QUALITY CONTROL

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

B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Designation System for Joints in or between Fire-Resistance-Rated Constructions: Alphanumeric systems listed in UL’s “Fire Resistance Directory” under Product Category XHBN.

B. Head-of-Wall Fire-Resistive Joint Systems (Masonry wall assembly):
   1. Available UL-Classified Systems: HW-D- [four-digit number for design selected].
   2. Assembly Rating: As indicated or as required.
   3. Nominal Joint Width: As indicated or as required.
   4. Movement Capabilities: Class II - minimum 25 percent compression or extension.

C. Head-of-Wall Fire-Resistive Joint Systems (Gypsum board/steel stud wall assembly):
   1. Available UL-Classified Systems: HW-D- [four-digit number for design selected].
   2. Assembly Rating: As indicated or as required.
   3. Nominal Joint Width: As indicated or as required.
   4. Movement Capabilities: Class II - minimum 25 percent compression or extension.

D. Wall-to-Wall Fire-Resistive Joint Systems:
   1. Available UL-Classified Systems: WW-D- [four-digit number for design selected].
   2. Assembly Rating: As indicated or as required.
   3. Nominal Joint Width: As indicated or as required.
   4. Movement Capabilities: Class II - minimum 25 percent compression

E. Perimeter Fire-Resistive Joint Systems:
   1. Available UL-Classified Perimeter Fire-Containment Systems: CW-S [four-digit number for design selected].
      a. Integrity Rating: As indicated or as required.
      b. Insulation Rating: As indicated or as required.
      c. Linear Opening Width: As indicated.
SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Urethane joint sealants.
   2. Immersible joint sealants.
   3. Mildew-resistant joint sealants.
   4. Latex joint sealants.
   5. Acoustical joint sealants

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers eight samples of materials that will contact or affect joint sealants. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.


1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: For each kind and color of joint sealant required.

C. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.

D. Product test reports.

E. Preconstruction compatibility and adhesion test reports.

F. Preconstruction field-adhesion test reports.
G. Field-adhesion test reports.

1.4 WARRANTIES.

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

B. Provide sealant from a single manufacturer for all sealants on the project.

C. Preinstallation Conference: Conduct conference at Project site.

D. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

E. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:

F. Fire-resistive joint system tests are performed by UL or a qualified testing agency acceptable to authorities having jurisdiction.

G. Mock-ups: Contractor shall provide up to (5) five mockups, full width of joint and 12 inches long, for color selection.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those
referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Neutral-Curing Silicone Joint Sealant: (Exterior and interior traffic surfaces) ASTM C 920.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide DOW 890 SL Silicone Sealant or comparable product by one of the following:
      a. GE Advanced Materials - Silicones.
      b. Pecora Corporation.
   2. Type: Single component (S)
   3. Grade: pourable (P).
   4. Class: 100/50.
   5. Uses Related to Exposure: Traffic (T).

B. Neutral-Curing Silicone Joint Sealant (Exterior and interior non-traffic surfaces):
   ASTM C 920.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide DOW 795 Silicone Sealant or comparable product by one of the following:
      a. GE Advanced Materials - Silicones.
      b. Pecora Corporation.
   2. Type: Single component (S)
   3. Grade: nonsag (NS).
   4. Class: 100/50.
   5. Uses Related to Exposure: Nontraffic (NT).
C. Mildew-Resistant, Acid-Curing Silicone Joint Sealant: (Toilets and food preparation areas) ASTM C 920.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Dow Corning Corporation.
   b. GE Advanced Materials - Silicones.
   c. Pecora Corporation.

2. Type: Single component (S).
3. Grade: nonsag (NS).
4. Class: 100/50.
5. Uses Related to Exposure: Nontraffic (NT).

2.3 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BASF Building Systems.
   b. Bostik, Inc.
   c. Pecora Corporation.

2.4 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Pecora Corporation.
   b. USG Corporation.

2.5 JOINT SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to
control sealant depth and otherwise contribute to producing optimum sealant performance.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

1. Remove laitance and form-release agents from concrete.
2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
3.2 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

F. Acoustical Sealant Installation: Comply with ASTM C 919 and with manufacturer's written recommendations.

G. Fire-resistive Joint Installation: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

H. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
3.3 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
   a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
   b. Perform 1 test for each 1000 feet (300 m) of joint length thereafter or 1 test per each floor per elevation.


B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.4 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:
   a. Isolation and contraction joints in cast-in-place concrete slabs.
   b. Tile control and expansion joints.
   c. Joints between different materials listed above.
   d. Other joints as indicated.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.


1. Joint Locations:
   b. Joints between cast stone units.
   c. Control and expansion joints in unit masonry.
   d. Joints in glass unit masonry assemblies.
   e. Joints between metal panels.
   f. Joints between different materials listed above.
g. Perimeter joints between materials listed above and frames of doors, windows and louvers.
h. Control and expansion joints in ceilings and other overhead surfaces.
i. Other joints as indicated.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
   1. Joint Locations:
      b. Control and expansion joints in tile flooring.
      c. Other joints as indicated.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces
   1. Joint Locations:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints of exterior openings where indicated.
      c. Vertical joints on exposed surfaces of interior unit masonry, concrete, walls and partitions.
      d. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
      e. Other joints as indicated.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
   1. Joint Sealant Location:
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      b. Tile control and expansion joints where indicated.
      c. Other joints as indicated.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Location:
   a. Acoustical joints where indicated.
   b. Other joints as indicated.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 079200
SECTION 079513.13 - INTERIOR EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes interior expansion joint cover assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: For each expansion joint cover assembly.
   1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams and a tabular schedule of expansion joint cover assemblies.
C. Samples: For each expansion joint cover assembly and for each color and texture specified.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Furnish units in longest practicable lengths to minimize field splicing.
B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 WALL AND CEILING EXPANSION JOINT COVERS

A. Metal-Plate Wall and Ceiling Joint Covers - Type A: Metal cover plate fixed on one side of joint gap and free to slide on other. “Basis of Design” ASM and ASMC Series EJ Cover, by Construction Specialties, Inc (www.c-sgroup.com).

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
      b. Balco, Inc.
c. Construction Specialties, Inc.
d. MM Systems Corporation.

2. Application: Wall to wall (use ASM Series), and Wall to corner (use ASMC Series)

3. Fire-Resistance Rating: Not less than that of adjacent construction.

4. Exposed Metal:
   a. Aluminum: Clear anodic, Class I, with Kynar painted top plate in color to be selected by Architect form Manufacturer’s standard color selection.

2.3 MATERIALS

A. Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), Alloy 6061-T6 for sheet and plate.

B. Elastomeric Seals: Manufacturer’s standard preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Fire Barriers: Any material or material combination, to comply with performance criteria for required fire-resistance rating.

D. Moisture Barrier: Manufacturer’s standard, flexible elastomeric material.

E. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M.

2.4 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

2.5 ACCESSORIES

A. Moisture Barriers: Manufacturer’s standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.
   1. Provide where indicated on Drawings.

B. Manufacturer’s standard attachment devices, as indicated or required for complete installations.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies.

C. Comply with manufacturer’s written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.

D. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
   1. Repair or grout block out as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
   2. Install frames in continuous contact with adjacent surfaces.
      a. Shimming is not permitted.
   3. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
   4. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
   5. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
   6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.

E. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
   1. Provide in continuous lengths for straight sections.
   2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
   3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

F. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.

G. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.
H. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

I. Moisture Barrier Drainage: If indicated, provide drainage fittings and connect to drains.

3.2 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete.

B. Protect the installation from damage by work of other Sections.

END OF SECTION 079513.13
SECTION 079513.16- EXTERIOR EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes exterior building expansion joint cover assemblies.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Shop Drawings: For each expansion joint cover assembly.
      1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams.
   C. Samples: For each exposed expansion joint cover assembly and for each color and texture specified.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION
   A. Furnish units in longest practicable lengths to minimize field splicing.
   B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS
   A. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   B. Fire-Resistance Ratings: Provide expansion joint cover assemblies with fire barriers identical to those of systems tested for fire resistance according to UL 2079 by a qualified testing agency.
      1. Hose Stream Test: Wall-to-wall and wall-to-soffit assemblies shall be subjected to hose stream testing.
   C. Expansion Joint Design Criteria:
1. Type of Movement: Thermal.
   a. Nominal Joint Width: 2”.

2. Type of Movement: Seismic.
   a. Joint Movement: As indicated on Drawings.

2.3 EXTERIOR EXPANSION JOINT COVERS

A. Exterior Elastomeric-Seal Joint Cover: Assembly consisting of elastomeric seal anchored to surface-mounted frames fixed to sides of joint gap.

1. **Provide Emshield WFR2 by Emseal.**
2. Application: Wall to wall.
4. Fire-Resistance Rating: Not less than that of adjacent construction.
5. Exposed Section
   a. Silicone-Face Bellows:
      1) Color: As selected by Architect from full range of industry colors and color densities.

6. Seal: Preformed elastomeric membrane or extrusion.
   a. Color: As selected by Architect from manufacturer's full range.

2.4 MATERIALS

A. Aluminum: **ASTM B 221 (ASTM B 221M)**, Alloy 6063-T5 for extrusions; **ASTM B 209 (ASTM B 209M)**, Alloy 6061-T6 for sheet and plate.

B. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Fire Barriers: Any material or material combination, to comply with performance criteria for required fire-resistance rating.

D. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.

2.5 ACCESSORIES

A. Moisture Barriers: Manufacturer's standard moisture barrier consisting of a continuous, waterproof membrane within joint and attached to substrate on sides of joint.
1. Provide where indicated on Drawings.

B. Manufacturer's standard attachment devices, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

C. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.

D. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
   1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
   2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
   3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
   4. Install frames in continuous contact with adjacent surfaces.
      a. Shimming is not permitted.
   5. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.

E. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
   1. Provide in continuous lengths for straight sections.
   2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
   3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
F. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.

G. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

H. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

I. Moisture Barrier Drainage: If indicated, provide drainage fitting and connect to drains.

J. Transition to Roof Expansion Joint Covers: Coordinate installation of exterior wall and soffit expansion joint covers with roof expansion joint covers specified in Section 077129 "Manufactured Roof Expansion Joints." Install factory-fabricated units at transition between exterior walls and soffits and roof expansion joint cover assemblies.

3.2 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections.

END OF SECTION 079513
SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

PART I – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. Work under this section comprises of furnishing standard hollow metal doors and frames, including transom frames, sidelight and window frames with provision for glazed, paneled or louvered openings, fire labeled and non-labeled, as scheduled.

B. RELATED DOCUMENTS

1. Related documents, drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 specification sections apply to this section.

C. RELATED SECTIONS

1. Division 4 Section “Unit Masonry Assemblies” for embedding anchors for hollow metal work into masonry construction.
2. Division 6 Section “Rough Carpentry” for infill panels at sidelight applications indicated.
3. Division 8 Section “Door Hardware” for door hardware for hollow metal doors.
4. Division 9 Sections “Paints” for field painting hollow metal doors and frames.
5. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.02 REFERENCES

A. STANDARDS

1. NFPA 80 – Fire Doors and Windows
2. ANSI/SDI-100 – Recommended Specifications for Standard Steel Doors and Frames
4. SDI-105 – Recommended Erection Instructions for Steel Frames
5. SDI-107 – Hardware on Steel Doors (reinforcement application)
6. ANSI-A250.4 – Steel Doors and Frames Physical Endurance
7. UL10C - Standard for Positive Pressure Fire Tests of Door Assemblies

B. CODES
3. ANSI-A117.1 – Accessible and Usable Building and Facilities
4. ADA – Americans with Disabilities Act

1.03 SUBMITTALS

A. GENERAL REQUIREMENTS

1. Submit copies of the hollow metal door and frame shop drawings in accordance with Division 1, General Requirements.

B. PRODUCT DATA

1. Submit shop drawings showing fabrication and installation of standard steel doors and frames. Include details of each frame type, elevations of door and frame types, conditions at openings, details of construction, location and installation requirements of door and frame hardware reinforcements, and details of joints and connections. Show anchorage and accessory items.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

D. SHOP DRAWINGS

1. Provide a schedule of doors and frames using same reference numbers for details and door openings as those on the contract documents. Shop drawings should include the following information as applicable:

   a. Elevations of each door design.
   b. Details of doors, including vertical and horizontal edge details and metal thicknesses.
   c. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   d. Indicate shop fabricated components of large HM frame assemblies requiring field assembly, and detail site joinery required for the composite assembly to maintain uniform sight-lines.
   e. Locations of reinforcement and preparations for hardware, including removable mullions.
   f. Details of each different wall opening condition.
   g. Details of anchorages, joints, field splices, and connections.
   h. Details of accessories.
   i. Details of moldings, removable stops, and glazing.
   j. Details of conduit and preparations for power, signal, and control systems.
   k. Material thickness and/or gauge.
   l. Door core material.
m. Mortises and reinforcements.

n. Locations of exposed fasteners.

o. Glazed, louvered and paneled openings.

p. Mounting locations of standard hardware.

1.04 QUALITY ASSURANCE

A. SUBSTITUTIONS

1. All substitution requests must be submitted within the procedures and time frame as outlined in Division 1, General Requirements. Approval of products is at the discretion of the architect and his consultant.

2. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. MANUFACTURER QUALIFICATIONS

1. Manufacturer shall be a member in good standing of the Steel Door Institute (SDI).

C. FIRE RATED DOOR ASSEMBLIES

1. All labeled fire door assemblies to be of a type that have been classified and listed in accordance with the latest edition of NFPA80 and test in compliance with NFPA-252, and UL10C. A physical label is to be affixed to the fire door at an authorized facility; embossed labels are acceptable on standard 3 sided door frames.

2. For openings required to be fire rated exceeding limitations of labeled assemblies, submit manufacturer’s certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

3. Project requires door assemblies and components that are compliant with positive pressure and S-label requirements. Specifications must be cross-referenced and coordinated with hardware and other door manufacturers to ensure that total opening engineering is compatible with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies.

   a. Certification(s) of compliance shall be made available upon request by the Authority Having Jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

A. The supplier shall deliver all materials to the project site; direct factory shipments are not allowed unless agreed upon beforehand. Supplier shall coordinate delivery times and schedules with the contractor.
B. Deliver doors cardboard wrapped or crated to provide protection during transit and jobsite storage. Provide additional protection to prevent damage to any factory-finished doors. Mark all doors and frames with opening numbers as shown on the contract documents and shop drawings.

C. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to the architect. Otherwise, remove and replace damaged goods as directed.

D. Store doors and frames at the building site in a dry and secure place.

   1. Place units on minimum 4" high wood blocking.
   2. Avoid use of non-vented plastic or canvas shelters that could create a humidity chamber.
   3. If cardboard wrapper on door becomes wet, remove carton immediately.
   4. Provide 1/4" spaces between stacked doors to promote air circulation.

1.06 COORDINATION
A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.07 WARRANTY
A. All doors and frames shall be warranted in writing by the manufacturer against defects in materials and workmanship for a period of one (1) year commencing on the date of final completion and acceptance.

PART II - PRODUCTS

2.01 MANUFACTURERS
A. Subject to compliance with requirements, provide standard hollow metal doors and frames by one of the following:

   1. Ceco Corporation
   2. Curries Company
   3. Steelcraft Company

2.02 MATERIALS
A. All doors and frames shall be manufactured of commercial quality cold rolled steel per ASTM-A366 and A568 general requirements; galvanized to A60 or G60 or galvanealed to A40 minimum coating weight standard per ASTM-A924. Internal reinforcing may be manufactured of hot rolled pickled and oiled steel per ASTM-A569.

B. Supports and anchors shall be fabricated of not less that 18-gauge sheet steel, galvanized where galvanized frames are used.

C. Where items are to be built into exterior walls, inserts, bolts and fasteners shall be hot dipped galvanized in compliance with ASTM-A153, Class C or D as applicable.

D. Rust inhibitive enamel or paint primer shall be used, baked on, and suitable as a base for specified finish paints complying with ANSI A224.1, “Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces on Steel Doors and Frames.”

E. Provide all hollow metal doors and frames receiving electrified hardware with molex wiring harness and concealed plug connectors on one end to accommodate up to twelve wires. Coordinate molex connectors on end of the wiring harness to plug directly into the electrified hardware and the electric hinge.

F. Where specified supply embossed steel doors with wood grain appearance. Wood grain shall follow the pattern of a stile and rail wood door with both vertical and horizontal grain patterns. Doors with vision lites are required to have wood grain window kits.

2.03  STANDARD DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8

1. Design: Flush panel, as indicated.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
   a. Fire Door Core: As required to provide fire-protection ratings indicated.
   b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 4.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
      1) Locations: Exterior doors.
4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
5. Provide 1 3/4" thick doors of materials and ANSI/SDI-100 grades and models specified below, or as indicated on drawings or schedules:


B. Interior Doors: Level 2, Model 2 – Seamless

a. Interior doors shall be minimum 18-gauge steel with both lock and hinge rail edge of door intermittently welded, filled and ground smooth the full height of door.

1) Ceco: Regent-18-SEM
2) Curries: 707N-18
3) Steelcraft: LF18

C. Exterior Doors: Level 3, Model 2 – Seamless

a. Exterior doors shall be minimum 16-gauge galvanized or galvanealed steel with both lock and hinge rail edge of door intermittently welded, filled and ground smooth the full height of door. Exterior doors shall be insulated with a solid slab of expanded polystyrene or polyurethane foam permanently bonded to the inside of each face skin. The top of all doors shall be closed flush by the addition of a 16-gauge screwed-in top cap and sealed to prevent water infiltration. The bottom channel shall include weep-holes.

1) Ceco: Legion-16-SEM
2) Curries: 707N-16
3) Steelcraft: LF16-Polystyrene

D. All doors shall be reinforced for hardware as shown below where necessary to preclude the use of thru-bolts.

1. Exit Devices: 14-gauge
2. Door Closers: 12-gauge

E. All doors shall be beveled 1/8" in 2" and shall have top and bottom channels of not less than 16-gauge, flush or inverted, welded to the face sheets. Doors shall have a full height 14-gauge hinge rail reinforcement channel, or individual 10 gauge hinge reinforcements.

F. All doors to conform to ANSI-A250.4 Level “A” criteria and shall be tested to 1,000,000 operating cycles and 23 twist tests. Certification of Level “A” doors is to be submitted with approval drawings by supplier upon request. Do no bid or supply any type or gauge of door not having been tested and passed these criteria.
2.04 FRAMES

A. Provide hollow metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on the drawings and schedules. Conceal fastenings unless otherwise indicated.

1. Interior Frames: Level 2, 16-gauge
2. Exterior Frames: Level 2, 16-gauge, galvanized or galvanealed
3. Security Grade Frames: to be provided by Detention Equipment Contractor (DEC): (See SECTION 111910- CUSTOM/SECURITY HOLLOW METAL WORK)
   a. Ceco: SU Series
   b. Curries: M Series
   c. Steelcraft: F Series

B. All frames over 36" in width shall be 14 gauge.

C. Fabricate frames with mitered and faces only welded corners, re-prime at the welded areas. All welds to be flush with neatly mitered or butted material cuts.

D. All frames shall have minimum 7 gauge hinge reinforcements, 14-gauge lock strike reinforcing, and 12-gauge closer reinforcing.

E. Provide temporary shipping bars to be removed before setting frames.

F. Except on weatherstripped frames, drill stops to receive three (3) silencers on strike jambs of single frames and two (2) silencers on heads of double frames.

G. Provide minimum 0.0179" thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

2.05 FRAME ANCHORS

1) Jamb Anchors:
   a) Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
   b) Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
   c) Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

2) Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
3) Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at top of underlayment.

4) Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
   a) For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

2.06 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.

1. Clearances shall be no more than 1/8" at jambs and heads except between non fire rated pairs of doors which may be no more than 1/4." Not more than 3/4" at the bottom of the doors.

B. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel sheet.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

E. Unless otherwise indicated, provide exposed fasteners with countersunk flat or oval heads for exposed screws and bolts.

F. Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI-107 and ANSI-A115 Series specifications for door and frame preparation for hardware.

G. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site. Provide internal reinforcements for all doors to receive door closers and exit devices.

H. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
I. Provide glazing stops with minimum 0.0359-inch-thick steel or 0.040-inch-thick aluminum.

J. Provide non-removable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.

K. Provide screw-applied, removable, glazing beads on inside of glass and other panels in door.

L. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
   a. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
   b. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
   c. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
   d. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
   e. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.
   f. Provide glazing so as to meet Code for and fire rated assemblies (per Life Safety Plan and as indicated on the Door Schedule).

2.07 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDIA250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART III - EXECUTION

3.01 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.02 INSTALLATION
A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and install frames according to NFPA 80 for Fire-Rated Openings.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
   a. At fire-protection-rated openings, install frames according to NFPA 80.
   b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
   c. Install frames with removable glazing stops located on secure side of opening.
   d. Install door silencers in frames before grouting.
   e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
   a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.


4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

5. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:
   a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
   b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
   c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Glazing: Comply with installation requirements in Division 8 Section “Glazing” and with hollow metal manufacturer’s written instructions.
   1. Exterior Fixed Glazing: Confirm existence and placement of flashing at sill. Install frame as indicated. For face welded (not full profile welded) frames, provide body putty at hairline joints between frame sections and finish flush and suitable for painted finish. Furnish glazier glazing applied stops of depth to match frame stop and width indicated.
   2. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

E. Install steel doors, frames, and accessories according to shop drawings, manufacturer’s data, and as specified.

F. Comply with provisions of SDI-105, “Recommended Erection Instructions for Steel Door Frames,” unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

   1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
   2. In masonry construction, install at least 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
   3. At existing concrete or masonry construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
   4. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.
   5. Install fire-rated frames according to NFPA 80.

G. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100. Install fire rated doors with clearances specified in NFPA 80.

H.

3.03 ADJUSTING AND CLEANING
A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113
SECTION 081416 – FLUSH WOOD DOORS

PART I – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. Work under this section comprises of furnishing solid core doors (wood veneer faces and hardboard/MDF) light frames, factory fitting and machining and factory finishing for fire labeled and non labeled wood doors.

1.02 RELATED SECTIONS

1. Division 06, Section – Interior Architectural Woodwork
2. Division 08, Section – Door Hardware
3. Division 08, Section – Glass Glazing
4. Division 09, Section – Painting

1.03 REFERENCES

A. STANDARDS

1. NFPA-80 – Fire Doors and Windows
2. NFPA-105 – Recommend Practice for Installation of Smoke Controlled Door Assemblies
3. WDMA I.S. 1A – Wood Door Manufacturer’s Association, Flush Wood Door Performance Standards
4. UL10C - Standard for Positive Pressure Fire Tests of Door Assemblies

B. CODES

2. IBC 2012 – International Building Code
4. ADA – Americans with Disabilities Act

1.04 SUBMITTALS

A. GENERAL REQUIREMENTS

1. Submit copies of the hollow metal door and frame shop drawings in accordance with Division 1, General Requirements.
B. PRODUCT DATA

1. Submit shop drawings showing fabrication and installation of wood doors. Include details of door elevations, details of construction, location and installation requirements of door hardware.

C. SHOP DRAWINGS

1. Provide a schedule of doors and frames using same reference numbers for details and door openings as those on the contract documents. Shop drawings should include the following information:
   a. Door core material.
   b. Mortises and reinforcements.
   c. Glazed and louvered openings and material.
   d. Mounting locations of standard hardware.
   e. Elevation drawings.
   f. Dimensions and locations of blocking.
   g. Dimensions and locations of mortises and holes for hardware.
   h. Dimensions and locations of cutouts.
   i. Undercuts.
   j. Requirements for veneer matching.
   k. Doors to be factory finished and finish requirements.
   l. Fire-protection ratings for fire-rated doors.

D. SAMPLES

1. Upon request submit the following samples:
   a. Corner sections of doors approximately 8" x 10" with door faces and edgings representing the typical range of color and grain for each species of veneer and solid lumber required.
   b. Factory finishes applied to actual door face materials, approximately 8" x 10" inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
   c. Frames for light openings, 6" long, for each material, type, and finish required.
1.05 QUALITY ASSURANCE

A. SUBSTITUTIONS

1. All substitution requests must be submitted within the procedures and time frame as outlined in Division 1, General Requirements. Approval of products is at the discretion of the architect and his consultant.

B. MANUFACTURER QUALIFICATIONS

1. Manufacturer shall be a member in good standing of the Wood Door Manufacturer’s Association (WDMA).

2. Wherever possible obtain wood doors from a single manufacturer to ensure uniformity in quality of appearance and construction. All material supplied for this project to conform to WDMA I.S. 1A-97 for premium grade wood doors.

C. FIRE RATED DOORS

1. Project requires door assemblies and components that are compliant with positive pressure and S-label requirements. Specifications must be cross-referenced and coordinated with hardware and other door manufacturers to ensure that total opening engineering is compatible with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.

   a. Certification(s) of compliance shall be made available upon request by the Authority Having Jurisdiction.

   b. For units exceeding sizes of tested assemblies provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

2. A physical label to be permanently affixed to the fire door at an authorized facility. Furthermore, all 45, 60, and 90 minute label fire doors are to have manufacturer’s standard laminated stiles for improved screw holding and split resistance capability.

   a. At stairwell enclosures and where otherwise indicated, provide doors that have a maximum transmitted temperature end point of not more than 250 deg F above ambient after 30 minutes of standard fire-test exposure.
1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Doors are to be shipped from manufacturer in individual polybags, and shall be inspected immediately upon arrival at jobsite for any damage of defects.

B. Identify each door with individual opening numbers that correlate with designation system used on shop drawings and contract drawings for door, frames and hardware. Use only temporary, removable, or concealed markings.

C. Do not deliver or install doors until building is enclosed and weather tight, wetwork is complete and dry, and HVAC system is operating and maintaining ambient temperature and relative humidity at occupancy level in storage and installation areas.

1.07 WARRANTY

A. Warranties shall be in addition to, and not a limitation of other rights the owner may have under the contract documents.

B. Submit written warranty on manufacturer’s standard form signed by the manufacturer agreeing to replace or repair defective doors which have:

1. Delamination in any degree.
2. Warp or twist of 1/4” or more in any 3’ x 6” x 7’ plane of door face.
3. Telegraphing of stile, rail or core through face to cause surface variation in excess of 1/100” in any 3” spans.

C. Contractor shall replace or refinish doors where contractor’s work contributed to rejection or voiding of manufacturer’s warranty.

D. Solid core interior doors shall be warranted for the life of their installation.

PART II - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide wood doors by one of the manufacturers as listed.

2.02 FIRE RATED DOORS

1. All fire rated doors shall be supplied to meet UL10C positive pressure standards for category “B” doors. All required intumescent seals shall be supplied as specified in section 08 71 00 – Door Hardware.
2.03 DOORS

A. FACES FOR TRANSPARENT FINISH

1. Doors shall have premium grade AA faces with manufacturer’s standard five (5) ply construction; minimum 1/8” thick with stiles and rails bonded to the core.

2. Faces shall be minimum 1/50” at 12% moisture content thick after finish sanding.

3. Interior Solid-Core Doors:

   1. Grade: Premium, with Grade AA faces.
   2. Species: Select white maple.
   3. Cut: Plain sliced (flat sliced).
   5. Assembly of Veneer Leaves on Door Faces: Balance match.
   6. Pair and Set Match: Provide for doors hung in same opening.
   7. Core: Either glued wood stave or structural composite lumber.
   8. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

4. Exposed vertical edges shall be of the same species as the face material.

5. Doors shall have minimum 1” stiles on the hinge stile and 13/16” minimum on the lock stile; both stiles faces shall match the door veneer. Top and bottom rails shall be a minimum 13/16”; rails shall be mill option hardwood or structural composite lumber (SCL).

B. NON RATED AND 20 MINUTE DOORS

1. Supply engineered core complying with WDMA I.S. 1A, bonded to door faces, stiles and rails using a Type I adhesive. Components are to be assembled to meet or exceed 20 minute fire door specifications for UL10c fire test requirements. Door shall meet or exceed WDMA I.S. 1A Extra Heavy Duty performance standards.

   a. Algoma: FGFW
   b. Eggers: SCL5 / SCL5-20
   c. Graham: GPD EC5 / GPD EC5-20
   d. Marshfield: DCL-1 / DCL-20
   e. VT Industries: 5508
C. FIRE RATED DOORS OVER 20 MINUTES

1. Supply fire resistive composite mineral core construction to provide the fire rating indicated, boned to door faces, stiles and rails using a Type I adhesive. Components are to be assembled to meet or exceed fire door specifications for UL10C fire test requirements.
   a. Algoma: FD
   b. Eggers: FGP
   c. Graham: GPD FD5
   d. Marshfield: DFM
   e. VT Industries: 5545/5511

2. For mineral-core doors, provide composite blocking with improved screw holding capability approved for use in doors of fire ratings indicated as necessary to eliminate need for through-bolting hardware and as follows:
   a. Provide 5" top-rail blocking.
   b. Provide 4 1/2" x 10" lock blocks.
   c. Provide 5" mid-rail blocking, at doors indicated to have exit devices.

3. At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.

2.04 FACTORY FINISHING

A. Finish all doors to receive a transparent finish at the factory as indicated below; field finish doors indicated to receive an opaque finish in accordance with Division 9, Finishes.

1. Grade: Premium
2. Finish: WDMA TR-6 catalyzed polyurethane.
3. Stain: Clear-coat only.
4. Effect: Semi-filled finish, produced by applying an additional finish coat to partially fill the wood pores.

B. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

C. Finish doors using three (3) coats of water-clear 100% solids, modified acrylic urethane, cured immediately with ultra-violet light.

D. Factory seal transparent finish doors on all six (6) sides using manufacturer's standard meeting these applications.
2.05 LIGHT FRAMES

A. Provide wood beads for light openings in doors up to and including 20-minute rating; at 20-minute rated doors provide wood beads and metal glazing clips approved for such use.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.

B. For fire-rated doors over 20-minute rated provide manufacturer's standard metal light frame formed of 0.048 inch thick cold-rolled steel sheet with baked-enamel or powder-coated finish approved for use in doors of fire rating indicated.

2.06 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Premachine metal astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Trim openings with moldings of material and profile indicated.

PART III - EXECUTION

3.01 EXAMINATION

A. Examine installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
2. Reject doors with defects.

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

3.02 INSTALLATION

A. For hardware installation, see Division 8 Section "Door Hardware."

B. Install wood doors to comply with manufacturer's written instructions, referenced quality standard and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Align factory fitted doors in frames for uniform clearance at each edge.

3.03 ADJUSTING AND PROTECTING

A. Rehang or replace doors that do not swing or operate freely.

B. Refinish or replace doors damaged during installation.

C. Protect doors as recommended by door manufacturer to ensure that wood doors are without damage or deterioration at the time of Substantial Completion.
SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Wall access doors and frames.
   2. Fire-rated wall access doors and frames.
   3. Ceiling access doors and frames.

B. Related Sections include the following:
   1. Division 4 Section “Unit Masonry Assemblies” for anchoring and grouting access door frames set in masonry construction.
   2. Division 23 Section “Air Duct Accessories” for heating and air-conditioning duct access doors. This (083113) material specification includes access doors required for Division 23 (HVAC) and Division 26 (Electrical) work. In accordance with Division 21 Section 210500, Division 22 Section 220500, Division 23 Section 230500, and Division 26 Section 260500, the Division 21, 22, 23, and 26 subcontractors shall furnish required access doors to installing trades.

1.2 SUBMITTALS

A. Product Data: For each type of access door and frame indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each door face material in specified finish.

D. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.3 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.
PART 2 - PRODUCTS

2.1 STEEL MATERIALS

A. Recycled Content: Provide steel with minimum 30 percent total recycled content, including at least 25 percent post-consumer recycled content.

B. Steel Sheet: electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS) with A60 (ZF180) zinc-iron-alloy (galvannealed) coating or G60 (Z180) mill-phosphatized zinc coating.

D. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Factory-Primed Finish: Manufacturer's standard shop primer.

E. Drywall Beads: 0.0299-inch (0.76-mm) zinc-coated steel sheet to receive joint compound.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Babcock-Davis; A Cierra Products Co.
   2. Dur-Red Products.
   3. Milcor Inc.
   4. J. L. Industries, Inc.

   2. Door: Minimum 0.060-inch- (1.5-mm-) thick sheet metal.
   3. Frame: Minimum 0.060-inch- (1.5-mm-) thick sheet metal with drywall bead flange.
   5. Lock: Cylinder.
2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view, provide materials with smooth, flat surfaces without blemishes.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
   1. For trimless frames with drywall bead for installation in gypsum board assembly, provide edge trim for gypsum board securely attached to perimeter of frames.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
   1. For cylinder lock, furnish two keys per lock and key all locks alike.

2.4 STEEL FINISHES

A. Surface Preparation: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
   1. Interiors (SSPC Zone 1A): SSPC-SP 3, “Power Tool Cleaning.”

B. Apply shop primer to uncoated surfaces of metal fabrications. Comply with SSPC-PA 1, “Paint Application Specification No. 1,” for shop primer application. See Division 9 Section “Paints” for field-applied finish coats.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.
3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113
SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior storefront framing.
2. Exterior manual-swing entrance doors and door frame units.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:
   a. Deflection exceeding specified limits.
   b. Thermal stresses transferring to building structure.
   c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
   d. Noise or vibration created by wind and by thermal and structural movements.
   e. Loosening or weakening of fasteners, attachments, and other components.
   f. Failure of operating units.

B. Wind Loads: As indicated on Drawings.

C. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to
less than 1/8 inch (3.2 mm) and clearance between members and operable units directly below them to less than 1/16 inch (1.5 mm).

D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
2. Test Durations: 10 seconds.

E. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).

F. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 12 lbf/sq. ft. (575 Pa).

1.3 SUBMITTALS

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

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
2. Include all attachment and connection details which may include misc. angles, strap anchors, plates, etc. as required to connect to the building steel beams or metal stud framing. Details shall be shown in context of this project (not manufacturer’s standard details) and shall incorporate the surrounding building material/assemblies/flashing and weatherproofing. Details shall address attachment connections and coordination with weatherproof envelope.

C. Samples: For each type of exposed finish required.

D. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.
a. Include any and all point to point wiring diagrams as they relate to coordination between the storefront assemblies and the door hardware and electrified door hardware components.

E. Product test reports.

F. Field quality-control reports.

G. Maintenance data.

H. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer’s authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Coordination Responsibility: The window installer is responsible for providing all attachments and connection which may include misc. angles, strap anchors, plates, etc. as required to connect to building steel beams or metal stud framing. The window installer is responsible for designing those connections and coordinating with other building elements. Connections shall be detailed on shop drawings stamped by the window installer’s structural engineer.

D. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer’s standard units in systems similar to those indicated for this Project.

E. Product Options: Information on Drawings and in Specifications establishes requirements for systems’ aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

F. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board’s ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

G. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

H. Preinstallation Conference: Conduct conference at Project site.
1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 STOREFRONT MANUFACTURERS

A. Basis-of-Design Products by: Kawneer. Subject to compliance with requirements, provide or comparable product by one of the following:

1. EFCO Corporation.
2. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.

B. Window / Door Schedule (see drawings for all details and sizes)

1. Exterior Storefront Product, Basis of Design
   a. Trifab VG 451T, by Kawneer
      1) Construction: Thermally broken.
      2) Glazing System: Retained mechanically with gaskets on four sides.
      4) Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
      5) Steel Reinforcement: As required by manufacturer.
   b. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
   c. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
   d. Coordination Responsibility: The window installer is responsible for providing all attachments and connection which may include misc. angles, strap anchors, plates, etc. as required to connect to building steel beams or metal stud framing. The window...
installer is responsible for designing those connections and coordinating with other building elements. Connections shall be detailed on shop drawings stamped by the window installer's structural engineer.

2. Exterior Storefront Entrance Doors, Basis of Design
   a. Standard 500 Series, Wide Stile, by Kawneer
      1) Door Construction: 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
      2) Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
      3) Provide nonremovable glazing stops on outside of door.
      4) Door Design: Large stile; 5-inch (88.9-mm) nominal width.
      5) Accessible Doors: Smooth surfaced for width of door in area within 10 inches (255 mm) above floor or ground plane.
      6) Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
      7) Provide nonremovable glazing stops on inside of door.
      8) Coordinate door and hardware with card reader system, power assist system, and security system.
      9) Provide door head concealed closer.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
   4. Structural Profiles: ASTM B 308/B 308M.
   5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
   1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
C. Recycled Content: Provide aluminum and steel with minimum 30 percent total recycled content.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer’s standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken at all exterior and vestibule storefront, Non-Thermally broken at all interior storefront.
2. Glazing System: Retained mechanically with gaskets on four sides.

B. Recycled Content: Provide aluminum with minimum 30 percent total recycled content.

C. Brackets and Reinforcements: Manufacturer’s standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer’s standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Installer note: (see requirements for installer responsibilities for attachment under Part 1.3 Submittals, and Part 1.4 Quality Assurance).

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

F. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.

G. Framing System Gaskets and Sealants: Manufacturer’s standard, recommended by manufacturer for joint type.

1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2.4  GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. See drawing details for glazed metal panels at Curtainwall locations. Coordinate installation per details.

2.5  ENTRANCE DOOR HARDWARE

A. Refer to Division 08 Section Door Hardware for entrance door hardware specified in that Section.

B. Weather Stripping: Manufacturer's standard replaceable components.

C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

D. Silencers: BHMA A156.16, Grade 1.

E. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (13 mm).

1. Coordinate threshold installation with walk off mat assembly at Vestibule 101. Provide threshold installation with no gab between walk off mat frame assembly. Coordinate threshold installation so that material transitions are completely concealed.

2.6  ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

2.7  FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF resin by weight in both color coat and clear topcoat.

1. Color and Gloss: As selected by Architect from manufacturer's full range of colors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.
7. Provide all anchors, clips, plates, angles or other attachment devices as needed to securely attach aluminum frames to metal studs.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

END OF SECTION 084113
SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes commercial door hardware for the following:
   1. Swinging doors.
   2. 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. Automatic operators.
   4. 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”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. UL/ULC and CSA C22.2 – Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
   8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:
   1. ANSI/BHMA Certified Product Standards - A156 Series
   2. UL10C – Positive Pressure Fire Tests of Door Assemblies
1.2 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:
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.
d. 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.

F. 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 Submittals.

1.3 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. 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.
C. 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.

D. 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.

E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

F. 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.

G. 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

H. At completion of installation, provide written documentation that components were applied to manufacturer’s instructions and recommendations and according to approved schedule.

1.4 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".

1.5 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 Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. 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.

1.6 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. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
1. Seven years for heavy duty cylindrical (bored) locks and latches.
2. Five years for exit hardware.
3. Twenty five years for manual surface door closer bodies.
4. Five years for motorized electric latch retraction exit devices.
5. Two years for electromechanical door hardware.

1.7 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

   A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

   B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

      1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

   C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

   A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.

      1. Quantity: Provide the following hinge quantity, unless otherwise indicated:

         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 where indicated in the Hardware Sets or on Drawings:
   a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Acceptable Manufacturers:
   a. Bommer Industries (BO).
   b. Hager Companies (HA).
   c. McKinney Products (MK).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge, with minimum 0.120-inch thick extruded 6060 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. Acceptable Manufacturers:
   a. Bommer Industries (BO).
   b. McKinney Products (MK).
   c. Pemko Manufacturing (PE).

2.3 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. Acceptable Manufacturers:
DOOR HARDWARE

A. Pemko Manufacturing (PE) – EL-CEPT Series.
   b. Securitron (SU) - EL-CEPT Series.
   c. Von Duprin (VD) - EPT-10 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:
      b. McKinney Products (MK) - Connector Hand Tool: QC-R003.

   2. Acceptable Manufacturers:

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

   1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
   2. Furnish dust proof strikes for bottom bolts.
   3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
   4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

   5. Acceptable Manufacturers:
      a. Burns Manufacturing (BU).
      b. Rockwood Manufacturing (RO).
      c. Trimco (TC).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls 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. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Acceptable Manufacturers:
   a. Hiawatha, Inc. (HI).
   b. Rockwood Manufacturing (RO).
   c. Trimco (TC).

2.5 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. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

1. Acceptable Manufacturers:
   a. Corbin Russwin Hardware (RU).
   b. No Substitution.

C. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. 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.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Conduct specified "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. Existing System: Key locks to Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:
   1. Change Keys per Cylinder: Three (3).
   2. Master Keys (per Master Key Level/Group): Five (5).
   4. Construction Control Keys (where required): Two (2).
   5. Permanent Control Keys (where required): Two (2).

F. Construction Keying: Provide construction master keyed cylinders.

G. 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.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.
   1. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
   2. Locks are to be non-handed and fully field reversible.
   3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to 2 million cycles.

   4. Acceptable Manufacturers:
      a. Corbin Russwin Hardware (RU) – CL3300 Series.
      b. Sargent Manufacturing (SA) – 10 Line.
      c. Stanley Best (BE) – 9K Series.

2.7 LOCK AND LATCH STRIKES

A. 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.

B. Standards: Comply with the following:

2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.8 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. 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.

2. 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.

3. 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.

4. 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.

5. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific
controllers when conventional power supplies are not sufficient to provide the proper inrush current.

6. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.

7. 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.

8. 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.

9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.

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 (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Acceptable Manufacturers:
   a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
   b. Sargent Manufacturing (SA) - 80 Series.
   c. Von Duprin (VD) - 35A/98 XP Series.

C. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.

1. Provide keyed removable feature where specified in the Hardware Sets.

2. Provide stabilizers and mounting brackets as required.
3. Provide electrical quick connection wiring options as specified in the hardware sets.

4. Acceptable Manufacturers:
   a. Corbin Russwin Hardware (RU) - 700/900 Series.
   b. Sargent Manufacturing (SA) - 980S Series.
   c. Von Duprin (VD) - 9954 Series.

2.9 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 including installation and adjusting information on inside of cover.

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. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. 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 physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. 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 (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty 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 and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Acceptable Manufacturers:
   a. Corbin Russwin Hardware (RU) – DC6000 Series.
   b. Sargent Manufacturing (SA) - 351 Series.
   c. Norton Door Controls (NO) - 7500 Series.

2.10 ELECTROHYDRAULIC DOOR OPERATORS

A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Standard: Certified ANSI/BHMA A156.19.

C. Performance Requirements:
   1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
   2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

E. Certification: Furnish Operators with GreenCircle Certification.

F. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.

G. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.
H. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

I. Brackets and Reinforcements: Manufacturer’s standard, fabricated from aluminum with nonferrous shims for aligning system components.

J. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Norton Door Controls (NO) - 6000 Series.

2.11 ARCHITECTURAL TRIM

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 certified 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. Acceptable Manufacturers:
   a. Hiawatha, Inc. (HI).
   b. Rockwood Manufacturing (RO).
   c. Trimco (TC).
2.12 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 certified 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. Acceptable Manufacturers:
   a. Hiawatha, Inc. (HI).
   b. Rockwood Manufacturing (RO).
   c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Acceptable Manufacturers:
   a. Rixson Door Controls (RF).
   b. Rockwood Manufacturing (RO).
   c. Sargent Manufacturing (SA).

2.13 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 NPFA 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. Acceptable Manufacturers:

1. National Guard Products (NG).
2. Pemko Manufacturing (PE).

2.14 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. Acceptable Manufacturers:

   a. Securitron (SU) - DPS Series.

B. Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Acceptable Manufacturers:

   a. Securitron (SU) - BPS Series.
2.15 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.

2.16 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.

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:

2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
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. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. 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: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.
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.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. RU - Corbin Russwin
5. RF - Rixson
6. NO - Norton
7. SU - Securitron

**Hardware Sets**

**Set 1.0**

Doors: 101A

2 Continuous Hinge

1 Removable Mullion

1 Exit Device (rim, exit only)

1 Exit Device (rim, key entry)

3 Mortise Cylinder

1 Rim Cylinder

2 Pull

2 Concealed Overhead Stop

1 Surface Closer

1 Drop Plate (As Required)

1 Door Operator

1 Threshold

1 Rain Guard

1 Gasketing (mullion)

2 Sweep (w/drip edge)

2 Frame Harness

2 ElectroLynx Harness

2 Electric Power Transfer

2 Position Switch

1 Operator Switch

1 Vestibule Switch

3 Push Button

1 Keyswitch

1 Power Supply

Notes: Perimeter/meeting stile seals by frame/door supplier. Card reader by security integrator.
Electronic Operation: Outside, Remote push button signals power supply to retract exit device latch allowing entry by door pull or automatic operator by wall switch. Key override. Inside, Free egress at all times by exit device or automatic operator by wall switch. Key switch powers operator switches.

Set 2.0

Doors: 101B

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<td>Continuous Hinge (\text{CFM95SLF-HD1 - CUT TO DOOR})</td>
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<td>Removable Mullion (\text{908BKM 8’ 6P L4 - Cut TO DOOR})</td>
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<td>Exit Device (rim, exit only) (\text{ED5200 EO M52})</td>
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<td>Exit Device (rim, key entry) (\text{ED5200 K157 x LC M52})</td>
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<td>Rim Cylinder (\text{3000-058- L4 CMK})</td>
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<td>Pull (\text{RM201 Mtg-Type 1XHD})</td>
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<td>Sweep (w/drip edge) (\text{3452CNB DOOR WIDTH})</td>
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Notes: Perimeter/meeting stile seals by frame/door supplier.

Set 3.0

Doors: 107B

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<td>Mortise Cylinder (\text{1000-118- A02- L4 CMK})</td>
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</tr>
</thead>
<tbody>
<tr>
<td>1 Drop Plate (As Required)</td>
<td>188F65</td>
<td>1</td>
<td>RU</td>
</tr>
<tr>
<td>1 Threshold</td>
<td>252x3AFG MSES25SS</td>
<td>1</td>
<td>PE</td>
</tr>
<tr>
<td>1 Rain Guard</td>
<td>346C DOOR WIDTH +4&quot;</td>
<td>1</td>
<td>PE</td>
</tr>
<tr>
<td>1 Sweep (w/drip edge)</td>
<td>3452CNB DOOR WIDTH</td>
<td>1</td>
<td>PE</td>
</tr>
<tr>
<td>1 Position Switch</td>
<td>DPS-M/W-BK</td>
<td>1</td>
<td>SU</td>
</tr>
</tbody>
</table>

Notes: Perimeter/meeting stile seals by frame/door supplier.

**Set 4.0**

Doors: 101D

<table>
<thead>
<tr>
<th>Item</th>
<th>Code</th>
<th>Qty</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Continuous Hinge</td>
<td>CFM95SLF-HD1 - CUT TO DOOR HEIGHT</td>
<td>2</td>
<td>PE</td>
</tr>
<tr>
<td>2 Push Pull</td>
<td>RM251 Mtg-Type 1XHD</td>
<td>2</td>
<td>RO</td>
</tr>
<tr>
<td>2 Concealed Overhead Stop</td>
<td>6-336</td>
<td>2</td>
<td>RF</td>
</tr>
<tr>
<td>2 Surface Closer</td>
<td>DC6220</td>
<td>2</td>
<td>RU</td>
</tr>
<tr>
<td>2 Drop Plate (As Required)</td>
<td>188F65</td>
<td>2</td>
<td>RU</td>
</tr>
</tbody>
</table>

Notes: Perimeter/meeting stile seals by frame/door supplier.

**Set 5.0**

Doors: 101C

<table>
<thead>
<tr>
<th>Item</th>
<th>Code</th>
<th>Qty</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Continuous Hinge</td>
<td>CFM95SLF-HD1 - CUT TO DOOR HEIGHT</td>
<td>2</td>
<td>PE</td>
</tr>
<tr>
<td>2 Push Pull</td>
<td>RM251 Mtg-Type 1XHD</td>
<td>2</td>
<td>RO</td>
</tr>
<tr>
<td>2 Concealed Overhead Stop</td>
<td>6-336</td>
<td>2</td>
<td>RF</td>
</tr>
<tr>
<td>2 Surface Closer</td>
<td>DC6220</td>
<td>2</td>
<td>RU</td>
</tr>
<tr>
<td>1 Drop Plate (As Required)</td>
<td>188F65</td>
<td>1</td>
<td>RU</td>
</tr>
<tr>
<td>1 Door Operator</td>
<td>6020 D</td>
<td>1</td>
<td>NO</td>
</tr>
<tr>
<td>1 Operator Switch</td>
<td>505</td>
<td>1</td>
<td>NO</td>
</tr>
</tbody>
</table>

Notes: Vestibule switch provided in Set 1.0. Perimeter/meeting stile seals by frame/door supplier.

**Set 6.0**

Doors: 107A
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Model No.</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Hinge (heavy weight)</td>
<td>T4A3786 NRP 4-1/2' x 4-1/2''</td>
<td>US26D</td>
<td>MK</td>
<td></td>
</tr>
<tr>
<td>2 Exit Device (surface vertical rod,</td>
<td>ED5470B N955 M55</td>
<td>630</td>
<td>RU</td>
<td></td>
</tr>
<tr>
<td>classroom)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Rim Cylinder</td>
<td>3000-058- L4 CMK</td>
<td>626</td>
<td>RU</td>
<td></td>
</tr>
<tr>
<td>2 Surface Closer</td>
<td>DC6210 A4</td>
<td>689</td>
<td>RU</td>
<td></td>
</tr>
<tr>
<td>2 Kick Plate</td>
<td>K1050 10'' HVBEV CSK</td>
<td>US32D</td>
<td>RO</td>
<td></td>
</tr>
<tr>
<td>1 Gasketing (head/jamb)</td>
<td>S88BL 20'</td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>2 Astragal (split)</td>
<td>297AS DOOR HEIGHT</td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>2 Sweep</td>
<td>315CN DOOR WIDTH</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Set: 7.0**

Doors: 102A

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Model No.</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Hinge (heavy weight)</td>
<td>T4A3786 NRP 4-1/2' x 4-1/2''</td>
<td>US26D</td>
<td>MK</td>
<td></td>
</tr>
<tr>
<td>2 Exit Device (surface vertical rod,</td>
<td>ED5470B N955 M55</td>
<td>630</td>
<td>RU</td>
<td></td>
</tr>
<tr>
<td>classroom)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Rim Cylinder</td>
<td>3000-058- L4 CMK</td>
<td>626</td>
<td>RU</td>
<td></td>
</tr>
<tr>
<td>2 Surface Closer</td>
<td>DC6210 A4</td>
<td>689</td>
<td>RU</td>
<td></td>
</tr>
<tr>
<td>4 Kick Plate</td>
<td>K1050 10'' HVBEV CSK</td>
<td>US32D</td>
<td>RO</td>
<td></td>
</tr>
<tr>
<td>2 Electromagnetic Holder</td>
<td>998 120VAC</td>
<td>689</td>
<td>RF</td>
<td></td>
</tr>
<tr>
<td>1 Gasketing (head/jamb)</td>
<td>S88BL 21'</td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>2 Astragal (split)</td>
<td>297AS DOOR HEIGHT</td>
<td></td>
<td>PE</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Template closer to swing 180 degrees.  
Connect holder to fire alarm system to release upon fire alarm.

**Set: 8.0**

Doors: 105

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Model No.</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Hinge (heavy weight)</td>
<td>T4A3786 4-1/2'' x 4-1/2''</td>
<td>US26D</td>
<td>MK</td>
<td></td>
</tr>
<tr>
<td>2 Exit Device (surface vertical rod,</td>
<td>ED5470B EO M55</td>
<td>630</td>
<td>RU</td>
<td></td>
</tr>
<tr>
<td>exit only)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Surface Closer</td>
<td>DC6210 A3</td>
<td>689</td>
<td>RU</td>
<td></td>
</tr>
<tr>
<td>4 Kick Plate</td>
<td>K1050 10'' HVBEV CSK</td>
<td>US32D</td>
<td>RO</td>
<td></td>
</tr>
<tr>
<td>1 Gasketing (head/jamb)</td>
<td>S88BL 21'</td>
<td></td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>2 Astragal (split)</td>
<td>297AS DOOR HEIGHT</td>
<td></td>
<td>PE</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Template closer to swing 180 degrees.  
Connect holder to fire alarm system to release upon fire alarm.
Set 9.0

Doors: 105B

6 Hinge TA2714 NRP 4-1/2" x 4-1/2" US26D MK
1 Dust Proof Strike 570 US26D RO
2 Flush Bolt (manual) 555 (or) 557 US26D RO
1 Storeroom Lock CL3357 NZD L4 CMK 626 RU
1 Surface Overhead Stop 10-336 630 RF
2 Surface Closer DC6210 A3 689 RU
2 Kick Plate K1050 10" HVBEV CSK US32D RO
2 Mop Plate K1050 4" HVBEV CSK US32D RO
2 Silencer 608 RO

Notes: Template closer to swing 180 degrees.

Set 10.0

Doors: 104

3 Hinge TA2714 4-1/2" x 4-1/2" US26D MK
1 Storeroom Lock CL3357 NZD L4 CMK 626 RU
1 Surface Closer DC6210 A4 689 RU
1 Kick Plate K1050 10" HVBEV CSK US32D RO
1 Gasketing (head/jamb) S88BL 17' PE

Set 11.0

Doors: 103

3 Hinge TA2714 4-1/2" x 4-1/2" US26D MK
1 Entrance Lock CL3351 NZD L4 CMK 626 RU
1 Surface Closer DC6200 A10 689 RU
1 Kick Plate K1050 10" HVBEV CSK US32D RO
1 Wall Stop 403 US26D RO
1 Gasketing (head/jamb) S88BL 17' PE
1 Sweep 315CN DOOR WIDTH PE

Set 12.0

Doors: 108B
<table>
<thead>
<tr>
<th>Set</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.0</td>
<td>Door Hardware</td>
<td>TA2714 4-1/2&quot; x 4-1/2&quot; US26D MK&lt;br&gt;CL355 NZD L4 CMK 626 RU&lt;br&gt;441CU US26D RO&lt;br&gt;608 RO</td>
</tr>
<tr>
<td></td>
<td>Doors: 106B, 108, 109</td>
<td></td>
</tr>
<tr>
<td>14.0</td>
<td>Door Hardware</td>
<td>TA2714 4-1/2&quot; x 4-1/2&quot; US26D MK&lt;br&gt;CL355 NZD L4 CMK 626 RU&lt;br&gt;403 US26D RO&lt;br&gt;S88BL 17' PE&lt;br&gt;315CN DOOR WIDTH PE</td>
</tr>
<tr>
<td></td>
<td>Doors: 110</td>
<td></td>
</tr>
<tr>
<td>15.0</td>
<td>Door Hardware</td>
<td>TA2714 4-1/2&quot; x 4-1/2&quot; US26D MK&lt;br&gt;CL355 NZD L4 CMK 626 RU&lt;br&gt;10-336 630 RF&lt;br&gt;S88BL 17' PE&lt;br&gt;315CN DOOR WIDTH PE</td>
</tr>
<tr>
<td></td>
<td>Doors: E01</td>
<td></td>
</tr>
<tr>
<td>16.0</td>
<td>Door Hardware</td>
<td>TA2714 4-1/2&quot; x 4-1/2&quot; US26D MK&lt;br&gt;CL355 NZD L4 CMK 626 RU&lt;br&gt;DC6200 A10 689 RU&lt;br&gt;K1050 10&quot; HVBEV CSK US32D RO&lt;br&gt;403 US26D RO&lt;br&gt;S88BL 17' PE&lt;br&gt;315CN DOOR WIDTH PE</td>
</tr>
<tr>
<td></td>
<td>Notes: Template closer to swing 180 degrees.</td>
<td></td>
</tr>
</tbody>
</table>

**DOOR HARDWARE**

087100 - 27
### Doors: 102B

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
<th>Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Hinge</td>
<td>TA2714 4-1/2&quot; x 4-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>1 Classroom Lock</td>
<td>CL3355 NZD L4 CMK</td>
<td></td>
</tr>
<tr>
<td>1 Surface Closer</td>
<td>DC6200 A10</td>
<td></td>
</tr>
<tr>
<td>1 Kick Plate</td>
<td>K1050 10&quot; HVBEV CSK</td>
<td></td>
</tr>
<tr>
<td>1 Wall Stop</td>
<td>403</td>
<td></td>
</tr>
<tr>
<td>1 Gasketing (head/jamb)</td>
<td>S88BL 17'</td>
<td></td>
</tr>
</tbody>
</table>

**Set: 17.0**

### Doors: 106A

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
<th>Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Hinge</td>
<td>TA2714 4-1/2&quot; x 4-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>1 Classroom Lock</td>
<td>CL3355 NZD L4 CMK</td>
<td></td>
</tr>
<tr>
<td>1 Surface Closer</td>
<td>DC6200 A10</td>
<td></td>
</tr>
<tr>
<td>1 Kick Plate</td>
<td>K1050 10&quot; HVBEV CSK</td>
<td></td>
</tr>
<tr>
<td>1 Wall Stop</td>
<td>403</td>
<td></td>
</tr>
<tr>
<td>1 Gasketing (head/jamb)</td>
<td>S88BL 17'</td>
<td></td>
</tr>
<tr>
<td>1 Sweep</td>
<td>315CN DOOR WIDTH</td>
<td></td>
</tr>
</tbody>
</table>

END OF SECTION 087100
SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Glass for windows, doors, interior borrowed lites, storefront framing.
2. Fire-Protection-Rated Glass
3. One-way mirror glass for window at SRO Office 103
4. Glazing sealants and accessories.

B. Related Sections included the following:
1. Division 8 Section “Aluminum Storefront” for Front entry.
2. Division 8 Section “Wood Doors”.
3. Division 8 Section “Hollow Metal Doors and Frames”.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain water- and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ICC's 2003 International Building Code by a qualified professional engineer, using the following design criteria:

1. Design Wind Pressures: As indicated on Drawings.
2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.4 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Preconstruction adhesion and compatibility test report.

1.5 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.


2. AAMA Publications: AAMA GDSG-1, ”Glass Design for Sloped Glazing,” and AAMA TIR-A7, ”Sloped Glazing Guidelines.”


B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer’s name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Source Limitations for Factory Glazing: Obtain insulated glazing one source and single manufacturer for each factory-glazed window type.
E. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

F. Glass Product Testing: Obtain glass test results for product test reports in “Submittals” Article from a qualified testing agency based on testing glass products.
   1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

G. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.

1.6 DELIVERY, STORAGE, AND HANDLING

   A. Protect glazing materials according to manufacturer’s written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 PROJECT CONDITIONS

   A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
   1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.8 WARRANTY

   A. Manufacturer’s Special Warranty for Coated-Glass Products: Manufacturer’s standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer’s written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
   1. Warranty Period: 10 years from date of Substantial Completion.

   B. Manufacturer’s Special Warranty on Laminated Glass: Manufacturer’s standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer’s written instructions. Defects include edge
separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer’s Special Warranty on Insulating Glass: Manufacturer’s standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer’s written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 FLAT GLASS MATERIALS

A. Product Manufacturers: Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.
1. AFG Industries, Inc.
2. Pilkington North America
3. PPG Industries, Inc.
4. Viraco

2.3 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated. Fully tempered where required by code. Contractor responsible for providing code compliant glass.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated. Fully tempered where required by code. Contractor responsible for providing code compliant glass.

C. Low-E IGU-Glass: ASTM C 1376, coated by sputter coated process, and complying with other requirements specified.

1. Basis-of-Design Product: Subject to compliance with requirements
   a. PPGSolarban 70XL (2) Solexia + Clear (G1)

2. 6 mm (1.4") minimum thick unless otherwise indicated.

3. Refer to requirements for sealed insulating glass units for performance characteristics of assembled units composed of tinted glass, coated or uncoated, relative to visible light transmittance, U values, shading coefficient and visible reflectance.

2.4 INSULATING GLASS (Glazing Types G1 and G2)

A. Manufacturers: Glazing characteristics shown below indicate minimum performance values. Other manufacturers’ glass must meet or exceed all performance value for each glazing type to be considered.

1. Type G1 (exterior window and door glazing as specified in Division 8 Sections “Aluminum Windows” and “Aluminum Storefront”)
   a. “Basis of Design” Product: PPGSolarban 70XL (2) Solexia + Clear
      1) VLT: .54%
      2) R Out: 10%
      3) Winter U: .28
      4) Summer U: .26
      5) SC: .29
      6) SHGC: .25
      7) LSG: 2.18

2. Type G2 shall be the same as G1, but shall also include a layer of opaque spandrel glazing at the 3rd surface of the window.
   a. Location: as indicated on the drawings.
   b. Include mineral wool board insulation at gap behind spandrel panel.
   c. Color: To be selected by Architect and Owner from full range of manufacturer’s full range of standard color options.
2.5 FIRE-PROTECTION-RATED GLAZING (Glazing Type G4)

A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings, indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.

B. Manufacturers: Glazing characteristics shown below indicate minimum performance values. Other manufacturers’ glass must meet or exceed all performance value for each glazing type to be considered. Acceptable manufactures include:
1. Safti First
2. Nippon electric Glasco. Ltd
3. Schott North America, Inc.
4. Vetrotech Saint – Grobain

5. Type G4 (Interior rated window and door glazing as specified in Division 8 Sections "Hollow Metal Frames and Doors", "Wood Doors", and "Aluminum Storefront")
      1) Thickness: 1/4"
      2) Fire Rating: 20 Minute
      3) Sound Transmission: STC 28
      4) Impact Safety Rating: CPSC 16 CFR 1201 Cat. I and II.

2.6 2-WAY MIRRORED GLASS (Glazing Type G5)

A. Manufacturers: Glazing characteristics shown below indicate minimum performance values. Other manufacturers’ glass must meet or exceed all performance value for each glazing type to be considered.

1. Type G5 (exterior window and door glazing as specified in Division 8 Sections "Aluminum Windows" and "Aluminum Storefront")
   a. "Basis of Design" Product: Pilkington Mirorpane
      1) Thickness: 1/4 inch.
      2) Glass Substrate: Grey
      3) VLT: 11%
      4) Visible Reflectance Coated side: 68%
   b. Location: Install, in combination with G4 20 minute rated glass, at the inside of window in SRO Office 103.

2.7 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C 864.
2. EPDM complying with ASTM C 864.
4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM, silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.8 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.

4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT as specified under Division 07 Section "Sealants" and suitable for use in structural glazing butt glazed corners.

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

D. Structural Glazing Sealants (SSG): GE® UltraGlaze®, one-component, high-strength neutral cure sealant, color as selected by Architect.

2.9 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
   1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
   2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.10 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site.
Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Apply heel bead of elastomeric sealant.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

G. Apply cap bead of elastomeric sealant over exposed edge of tape.
3.3 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.4 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances
do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

3.6 GLAZING SCHEDULE

A. See Drawings.

END OF SECTION 088000
SECTION 092900 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
3. Suspension systems for interior ceilings and soffits.
4. Exterior gypsum board for ceilings and soffits

B. Related Sections include the following:

1. Division 5 Section “Cold-Formed Metal Framing” for load-bearing steel framing and Division 06 for Exterior Glass-matt gypsum sheathing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Samples:

1.3 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.


B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.


1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 INTERIOR GYPSUM WALLBOARD

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. American Gypsum.
   3. USG Corporation.
   4. Certainteed Corporation

B. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

C. Gypsum Wallboard: ASTM C 36 or ASTM C 1396, as applicable to type of gypsum board indicated and whichever is more stringent.
   1. Regular Type: 5/8-inch and 1/2-inch thickness as indicated, tapered long edges.
      a. Location: Non fire-resistance-rated and non-moisture exposure applications.
   2. Type X: 5/8-inch thickness unless noted otherwise, tapered long edges.
      a. Location: Where required for fire-resistance-rated assembly.

D. Abuse-Resistant Gypsum Wallboard: Provide abuse resistant product that meets or exceeds ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M, and is manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels.
   1. Performance Requirements.
a. Soft Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
b. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
c. Indentation Resistance: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.

2. Core: 5/8-inch, Type X.
4. Location: At all interior walls gypsum walls below 8 feet.
5. Long Edges: Tapered.
6. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.3 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS
A. Exterior Gypsum Soffit Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.
   1. 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:
      a. Georgia-Pacific Building Products.
      c. United States Gypsum Company.

2. Exterior rated

2.4 TRIM ACCESSORIES
A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.

B. Aluminum Trim: ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
   1. Reveal Trim: Fry Reglet DRM-50-50, 1/2" X 1/2" or equal SAF.
   2. Control Joint: Fry Reglet or equal SAF.

C. Shapes: Reveals of size indicated.
   1. Cornerbead: Use at outside corners.
   2. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
   3. U-Bead: J-shaped; exposed short flange does not receive joint compound; use concealed location sealant joints.
4. Expansion (Control) Joint: Use where indicated and as required by ASTM C840.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
   1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
   3. Fill Coat: For second coat, use drying-type, all-purpose compound.
   4. Finish Coat: For third coat, use drying-type, all-purpose compound.
   5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

A. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing).
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

D. Acoustical Joint Sealant: ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings as demonstrated by testing according to ASTM E 90.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Pecora Corporation; AC-20 FTR.
   c. USG Corporation; SHEETROCK Acoustical Sealant.

E. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

F. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

2.7 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Components, General: Comply with ASTM C 754 for conditions indicated.
   1. Recycled Content: Provide steel with minimum 30 percent total recycled content, including at least 25 percent post-consumer recycled content.

B. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch-diameter wire.

C. Hangers: As follows:
   1. Wire Hangers: ASTM A 641, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet of base metal thickness of 0.0538 inch, a minimum 1/2-inch-wide flange, with ASTM A 653, G40, hot-dip galvanized zinc coating.
   1. Depth: 1-1/2 inches, for support hanger spacing not to exceed 48 inches.

      a. Minimum Base Metal Thickness: 0.0179 inch, unless noted otherwise.

F. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.
   1. Steel Studs and Tracks: ASTM C 645.
      a. Minimum Base-Metal Thickness: 0.0179 inch (0.455 mm).
      b. Depth: 1-5/8 inches (41 mm).
   2. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
      a. Minimum Base-Metal Thickness: 0.0179 inch (0.455 mm).

G. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. **Available Products:** Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   b. Chicago Metallic Corporation; Drywall Furring 640
   c. System USG Interiors, Inc.; Drywall Suspension System.

2.8 **STEEL PARTITION, BULKHEAD AND SOFFIT FRAMING**

A. **Components, General:** As follows:
   1. Comply with ASTM C 754 for conditions indicated.
   2. **Steel Sheet Components:** Complying with ASTM C 645 requirements for metal and with ASTM A 653, G40, hot-dip galvanized zinc coating for interior applications and ASTM A 653, G60, hot-dip galvanized zinc coating for exterior applications.
   3. **Recycled Content:** Provide steel with minimum 30 percent total recycled content, including at least 25 percent post-consumer recycled content.

B. **Steel Studs and Runners:** ASTM C 645.
   1. **Minimum Base Metal Thickness:** 0.0179 inch unless noted otherwise. Provide 0.0312 inch at HM door frames and to meet L/120 deflection requirements for tall partitions, and for cement backer board (tile backer board) framing.
   2. **Depth:** As indicated.

C. **Slip-Type Head Joints:** Where indicated, provide one of the following:
   1. **Clip System:** Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 1-1/2-inch (38-mm) minimum vertical movement.
   2. **Single Long-Leg Track System:** ASTM C 645 top track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
   3. **Double-Track System:** ASTM C 645 top outer tracks, inside track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
   4. **Deflection Track:** Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

D. **Firestop Tracks:** Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width as required for application.
   1. Minimum Base-Metal Thickness: 0.0179 inch (0.455 mm).

F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
   1. Depth: As indicated on Drawings or as required for application if not indicated.
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch-(1.72-mm-) thick, galvanized steel.

   1. Minimum Base Metal Thickness: 0.0179 inch.
   2. Depth: 7/8” or 1-1/2 inches, unless indicated otherwise.

H. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.

I. Cold-Rolled Furring Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange.
   1. Depth: 3/4 inch.
   2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch.
   3. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch-diameter wire.

J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.0179 inch (0.455 mm), and depth required to fit insulation thickness indicated.

K. Corner Angle: 2-1/2 by 2-1/2 inch angle, minimum bare metal thickness of 0.0179 inch.

L. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.
   1. Install specified 0.0312 inch (20 gage) steel framing to meet L/120 deflection at 5 psf standard of ASTM C 754.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
   1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
   2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.

D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

3.4 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Suspend ceiling hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits per referenced standards.

3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.

4. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

5. Do not attach hangers to steel deck tabs.

6. Do not attach hangers to steel roof deck. Attach hangers to structural members.

7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet measured lengthwise on each member and transversely between parallel members.

C. Sway-brace suspended steel framing with hangers used for support.

D. Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

E. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.
   1. Hangers: 48 inches o.c.
   2. Carrying Channels (Main Runners): 48 inches o.c.
   3. Furring Channels (Furring Members): 16 inches o.c.

F. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
3.5 INSTALLING STEEL PARTITION AND SOFFIT FRAMING

A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.
   1. Where studs are installed directly against exterior walls, install asphalt-felt or foam-gasket isolation strip between studs and wall.

B. 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.

C. 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.

3.6 APPLYING AND FINISHING PANELS GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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 sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

E. 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.

F. 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.

G. Install gypsum board with open horizontal joint (gap) not to exceed 1/2-inch above finished floor slab and tape and finish vertical joints to bottom edge of board to afford a smooth substrate for applied wall base.

H. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Attach gypsum panels to framing provided at openings and cutouts.
J. Form control and expansion joints with space between edges of adjoining gypsum panels.

K. 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 joists and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by joists and other structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

L. 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.

M. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

N. 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.

O. Space fasteners in gypsum panels according to referenced gypsum 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.

3.7 PANEL APPLICATION METHODS

A. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
1. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

B. Multi-layer 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.

C. Multi-layer 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.

D. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

E. Multilayer Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

F. Curved Surfaces: Install panels to comply with GA-226 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated.
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.
3.8 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim per 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. Install 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.

1. Aluminum Trim: Install in locations indicated on Drawings.
2. Control Joints: Install control joints at locations indicated on Drawings.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   a. Embed tape at joints in ceiling plenum areas and concealed areas, unless a higher level of finish is required for fire-resistance-rated and sound-rated assemblies.

2. Level 2: Panels that are substrate for tile.
   a. Embed tape and apply separate first and fill coats of joint compound to tape, fasteners, and trim flanges for wall areas to receive wood paneling system.

3. Level 3: Where indicated on Drawings.
   a. Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.

4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
a. Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.

b. Primer and its application to surfaces are specified in other Division 09 Sections.

E. Cementitious Backer Units: Finish according to manufacturer’s written instructions.

3.10 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.

1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.

2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
   a. Installation of 80 percent of lighting fixtures, powered for operation.
   b. Installation, insulation, and leak and pressure testing of water piping systems.
   c. Installation of air-duct systems.
   d. Installation of air devices.
   e. Installation of mechanical system control-air tubing.
   f. Installation of ceiling support framing.

B. Protect adjacent surfaces from drywall compound and texture finishes and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900
SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Porcelain tile.
   2. Crack Isolation Membrane
   3. Metal Edge Strips

B. Refer to Division 09 Section, Gypsum Board for tile backing panels.

C. Refer to Division 01 Section, Alternates, for deductive alternates.

1.2 SUBMITTALS

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

B. Samples:
   1. Each type and composition of tile and for each color and finish required.
   2. Assembled samples, with grouted joints, for each type and composition of tile and for each color and finish required.
   3. Stone thresholds in 6-inch (150-mm) lengths.

1.3 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

   1. Build mockup of each type of floor tile installation.
   2. Build mockup of each type of wall tile installation.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 EXTRA MATERIAL

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Ceramic floor paving tiles: Full-size tiles equal to 2.0 percent of quantity installed.
2. Ceramic wall tiles: Full-size tiles equal to 5 percent of quantity installed.

PART 2 - PRODUCTS

2.1 TILE PRODUCTS

A. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

B. Products: Refer to finish selections at the end of this section.

C. Composition: Porcelain

D. Provide sizes and patterns as shown on the drawings.

E. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide trim shapes, cap pieces, and cove base accessories at all tile edges and corners.

1. Provide shapes as follows, selected from manufacturer's standard shapes:
   a. Base: Coved as indicated on drawings, module size.
   b. External Corners: Bullnose, same size as adjoining flat tile.
   c. Internal Corners: Field-butted square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

2.2 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.

2.3 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Corrugated Polyethylene: Corrugated polyethylene with dovetail-shaped corrugations and with anchoring webbing on the underside; 3/16-inch (4-mm) nominal thickness.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Schluter Systems L.P.

2.4 SETTING MATERIALS


   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bonsal American; an Oldcastle company.
      b. Laticrete International, Inc.
      c. MAPEI Corporation.
   2. Prepackaged, dry-mortar mix combined with acrylic resin liquid latex additive.
   3. For wall applications, provide nonsagging mortar.

D. Organic Adhesive: ANSI A136.1, Type I, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bonsal American; an Oldcastle company.
      b. Laticrete International, Inc.
      c. MAPEI Corporation.

2.5 GROUT MATERIALS


B. Polymer-Modified Tile Grout: ANSI A118.7.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bonsal American; an Oldcastle company.
      b. Laticrete International, Inc.
      c. MAPEI Corporation.
   2. Polymer Type: Liquid-latex form for addition to prepackaged dry-grout mix.
2.6 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."

1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures. (Use in wall applications)

1. Products: Subject to compliance with requirements, provide one of the following:
   a. DAP Inc.; 100 percent Silicone Kitchen and Bath Sealant
   b. Dow Corning Corporation; Dow Corning 786.
   c. GE Silicones, a division of GE Specialty Materials; Sanitary 1700.

C. Multipart pourable urethane sealant for Use T: ASTM C920; Type M; Grade P; Class 25; Uses T, M, A, and as applicable to joint substrates indicated, O. (Use in floor applications)

1. Bostick, Chem-Calk 550
2. Mameco International, Inc.; Vulkem 245
4. Tremco, Inc.; THC-900

2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips and Control Joints:

1. “Basis of Design” Product: Subject to compliance with requirements, provide Schluter products as follows. Reference the Architectural drawings for the locations of these transition strips.
   a. Schluter “Dilex-Mop” – (expansion joint)
1) Description: Profile with serrated rigid, recycled PVC side sections connected by a soft PVC central movement zone, which form the 5/16" wide visible surface.

2) Material and Finish: AE – Satin Anodized Aluminum

3) Height: As required.

b. Schluter “Schiene” – (transition strip)
   1) Description: L-Shaped profile with 1/8 inch wide visible surface integrated trapezoid-perforated anchoring leg, and integrated grout join spacer.
   2) Material and Finish: AE – Satin Anodized Aluminum
   3) Height: as required.


d. Schluter “Reno-Ramp” – (Transition Strip): Between Tile and lower floor coverings as required by ADA.

C. Grout Sealer: Manufacturer’s standard silicone product for sealing grout joints and that does not change color or appearance of grout.

1. Use sealers that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Products: Subject to compliance with requirements, provide one of the following:
   a. ProSpec; Grout Sealer.
   b. Bostik, Inc.; Siloxane 220.
   c. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.

C. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:

   a. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
   b. Tile floors composed of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Review layout with Architect for approval prior to installation. If not indicated on any of the drawings, assume a stacked grid or 1/3rd offset grid layout. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
2. Glazed Wall Tile: 1/16 inch (1.6 mm).

F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Grout Sealer: Apply grout sealer to grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 INTERIOR TILE INSTALLATION SCHEDULE

See Finish Schedule and Finish Key and Finish plans and Bathroom plans and elevations for Tile and Finish designations, and locations.

END OF SECTION 093000
SECTION 095113 - ACOUSTICAL TILE SUSPENDED CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Acoustical tiles for interior ceilings.
   2. Fully concealed, direct-hung, suspension systems.

B. Related Sections: Section(s) related to this section include:
   1. Division 7 Sections “Interior Expansion Control Covers”.

1.2 SUBMITTALS

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

B. Coordination Drawings: Drawn to scale and coordinating acoustical panel ceiling installation with hanger attachment to building structure and ceiling mounted items:

C. Samples: For each exposed finish.

D. Product test reports.

E. Research/evaluation reports.

F. Maintenance data.

1.3 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory.

B. Fire-Test-Response Characteristics:
   1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
      a. Identify materials with appropriate markings of applicable testing and inspecting agency.

ACOUSTICAL TILE SUSPENDED CEILINGS
2. Surface-Burning Characteristics: Acoustical panels complying with ASTM E 1264 for Class A materials, when tested per ASTM E 84.
   a. Smoke-Developed Index: 450 or less.

C. Seismic Standard: Comply with the following:

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
   2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANEL CEILINGS, GENERAL

A. Acoustical Panel Standard: Comply with ASTM E 1264.
   1. Recycled Content: Provide acoustical ceiling tile with minimum 65 percent recycled content.

B. Metal Suspension System Standard: Comply with ASTM C 635.
   1. Recycled Content: Provide steel with minimum 30 percent total recycled content, including at least 25 percent post-consumer recycled content.
C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   1. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, “Direct Hung”) will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

E. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer’s standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

F. Antimicrobial Fungicide Treatment: Provide acoustical panels treated with manufacturer’s standard antimicrobial formulation that inhibits fungus, mold, and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Armstrong World Industries, Inc.
   2. CertainTeed Corporation.
   3. USG Corporation.

B. Acoustical Tile Standard: Manufacturer’s standard tiles of configuration indicated that comply with ASTM E 1264.

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

D. Basis of Design: Armstrong Ultima, 2x2

E. Light Reflectance (LR): 90%

F. Noise Reduction Coefficient (NRC): .75.

G. Color: White

H. Edge/Joint Detail: Tegular

I. Thickness: 3/4 inch (19 mm).
J. Modular Size: 24 by 24 inches (305 by 305 mm)

2.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING – GENERAL

A. Metal Suspension System Standard: Provide manufacturer’s standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM’s “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes. Provide manufacturer’s standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, “Direct Hung,” unless otherwise indicated. Comply with seismic design requirements.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
   2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, “Direct Hung”) will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.

E. Seismic Stabilizer Bars: Manufacturer’s standard perimeter stabilizers designed to accommodate seismic forces.

F. Retention Clips: Provide manufacturer’s heavy-duty retention clips, Armstrong #414 “Retention Clip” or approved equivalent

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong 9/16 inch Suprafine XL at all tiles; or one comparable by the following:
   1. United States Gypsum
   2. Chicago Metallic Corporation

2.5 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer’s standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
1. For all lay-in panels, provide Shadow style stepped edge.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than 6-inch width panels at borders.

3.3 INSTALLATION

A. Comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders.

C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling
suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

END OF SECTION 095113
SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Vinyl composition tile (VCT).
   2. Resilient wall base and accessories.

B. Related Sections: Section(s) related to this section include:
   1. Division 01 Section “Alternates” for possible substitution of VCT and Rubber Base for the Porcelain Tile and Porcelain Tile Base.
   2. Division 9 Sections “Carpet Tile” and “Sheet Carpet.”
   3. Concrete: Refer to Division 3 Concrete Sections for cast-in-place concrete, concrete toppings, and cementitious underlayments.
   4. Resilient Flooring Accessories: Refer to Division 9 Finishes Sections for resilient wall bases, reducer strips, metal edge strips and other resilient flooring accessories.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   2. ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
   5. ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
   11. ASTM E 989 Standard Classification for Determination of Impact Insulation Class (IIC).
1.3 SUBMITTALS

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

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

C. Samples: Full-size units of each color and pattern of floor tile required.

D. Certificate: Submit certificate indicating installer qualification.

E. Maintenance data.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: (as required by local authorities)
   1. Fire Performance Characteristics: Provide resilient linoleum sheet flooring with the following fire performance characteristics as determined by testing products in accordance with ASTM method indicated below by a certified testing laboratory or another testing and inspecting agency acceptable to authorities having jurisdiction:
      a. Critical Radiant Flux: Class 1 Rating per NFPA 253 (ASTM E 648) (0.45 watts/cm² or greater).
      b. Smoke Density: Less than 450 per NFPA 258 (ASTM E 662).

B. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
   1. Engage installer certified by manufacturer.

C. Mock-Ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner’s and Architect’s acceptance of finish color, texture and pattern, and workmanship standard. Comply with Division 1 Quality Control (Mock-Up Requirements) Section.
   1. Mock-Up Size: 48 inches by 48 inches
   2. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
   3. Incorporation: Mock-up may be incorporated into final construction upon Owner’s approval.

1.5 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor tile.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
C. Close spaces to traffic during floor tile installation.
D. Close spaces to traffic for 48 hours after floor tile installation.
E. Install floor tile after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS
A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
B. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
C. Resilient Wall Base and Accessories: Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.
D. Deliver extra materials to Owner. Obtain receipt from Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS.
A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products listed in other Part 2 articles.
B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 COLORS AND PATTERNS
A. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.3 VINYL COMPOSITION TILE – VCT
A. Vinyl Composition Tile (VCT): ASTM F 1066.
   1. Armstrong World Industries, Inc.; Imperial Texture Standard Excelon.
B. Class: Class 2 (through-pattern tile). “Through color” color composition is not acceptable.
C. Wearing Surface: Smooth.
C. Rubber Flooring: Comply with RFCI FloorScore Program.

D. Thickness: 0.125 inch.

E. Size: 12 by 12 inches.

F. Fire-Test-Response Characteristics:
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

G. Color: See drawings finish schedule and legend.

2.4 RESILIENT WALL BASE

A. Resilient Wall Base: Where indicated, provide ASTM F 1861 TP rubber or TV vinyl wall base, Group 1 Solid (homogeneous), complying with the following. Group 2 (layered) will not be considered.
   1. Products: See Drawings for Finish Schedule and Legend for Basis of Design Product. Acceptable manufacturers as follows:
      a. Endura Product Division Burke Industries, Rubber Wall Base
      b. Johnsonite; Vinyl Wall Base.
      c. Flexco (USA), Inc.; Vinyl Molded Wall Base.
      d. Johnsonite, "Traditional Rubber Wall Base - Cove"
   2. Color and Pattern: As specified by product designation indicated above.
   5. Height: 4 inches, unless noted otherwise
   6. Lengths: Coils in lengths standard with manufacturer, but not less than 96 feet.
   7. Outside Corners: Job formed.
   8. Inside Corners: Job formed.

2.5 INSTALLATION MATERIALS

A. As recommended by manufacturer for installation.

B. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

C. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
   1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
a. Tile Adhesives: Not more than 50 g/L.

D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer’s written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by floor covering manufacturer and as follows. Proceed with installation only after substrates pass testing. Follow manufacturer’s requirements for moisture testing.
   a. Concrete Moisture Testing: Conduct moisture tests on all concrete floors regardless of the age, grade level or the presence of existing flooring. Conduct calcium chloride tests in accordance with ASTM F 1869. Measure the internal relative humidity of the concrete slab in accordance with ASTM F 2170. One test of each type should be conducted for every 1,000 square feet of flooring (minimum of 3). The tests should be conducted around the perimeter of the room, at columns, and anywhere moisture may be evident. Concrete moisture vapor emissions must not exceed 8.0 lbs. per 1,000 square feet in 24 hours when using Forbo L 885 adhesive. Concrete internal relative humidity must not exceed 85% when using Forbo L 885 adhesive. A diagram of the area showing the location and results of each test should be submitted to the Architect, General Contractor or End User. If the test results exceed these limitations, the installation must not proceed until the problem has been corrected.
   b. Concrete pH Test: Perform pH tests on concrete floors regardless of the age or grade level. If the pH is greater than 11, it must be neutralized prior to beginning the installation.
C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 FLOOR TILE INSTALLATION

A. Adhesive Flooring Installation:
   1. Begin laying tiles at the starting point, ensuring that the tile is laid exactly along the layout lines. Because the tiles must be installed into wet adhesive, do not spread the adhesive in an area larger that the tile can be installed while the adhesive is still wet. The successful installation of border tiles is best accomplished by following one of two strategies.
      a. (1) When laying out tile, determine the edge of a field tile a comfortable distance from each wall and then snap chalk lines around the perimeter of the room. When spreading adhesive, use these lines as a guide to stop spreading adhesive and install the field tile up to the adhesive spread lines. Once the field tiles have been installed, the border tiles and be “dry” fitted (before spreading the adhesive). After the border tiles have been cut, adhesive can be applied in the area of the border tiles and the tiles can be placed immediately into the wet adhesive.
      b. (2) Plan the sequence of spreading adhesive so that the border tiles can be cut and placed into the adhesive before the adhesive working time has been exceeded. Immediately after installation, roll the tile with a 100 pound roller in both directions and repeat as necessary to ensure adequate transfer of adhesive to the backing.
   2. Adhesive Material Installation: Use trowel as recommended by flooring manufacturer for specific adhesive. Spread at a rate of approximately 150 ft²/gallon, as recommended by flooring manufacturer.

B. Installation Techniques:
   1. Where demountable partitions and other items are indicated for installation on top of finished flooring, install flooring before these items are installed.
   2. Scribe, cut, fit flooring to butt tightly to vertical surfaces, permanent fixtures and built-in furniture, including pipes, outlets, edgings, thresholds, nosings, and cabinets.
   3. Extend flooring into toe spaces, door reveals, closets, and similar openings.
4. Install flooring on covers for telephone and electrical ducts, and similar items occurring within finish floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers.

5. Do not install resilient flooring over expansion joints. Use expansion joint covers manufactured for use with resilient flooring. Refer to other specification sections for expansion joint covers.

6. Adhere resilient flooring to substrate without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed installation.
   a. Use adhesive applied to substrate in compliance with flooring manufacturer’s recommendations, including those for trowel notching, adhesive mixing, and adhesive open and working times.

7. Roll resilient flooring as required by resilient flooring manufacturer.

8. Finish Flooring Patterns: As selected by Architect.

3.3 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer’s recommended adhesive filler material.

F. Job-Formed Corners:
   1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
   2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Resilient Stair Accessories:
1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.
3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

B. Resilient Molding Accessories: Butt to adjacent materials; tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings otherwise exposed.

3.5 CLEANING AND PROTECTION

A. Cleaning
1. Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
2. Remove visible adhesive and other surface blemishes using cleaning methods recommended by floor manufacturer.
3. Sweep and vacuum floor after installation.
4. Do not wash floor until after time period recommended by flooring manufacturer.
5. Damp mop flooring to remove black marks and soil.

B. PROTECTION
1. Protection: Protect installed product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of Substantial Completion.

C. INITIAL MAINTENANCE PROCEDURES
1. General: Include in Contract Sum Amount cost for initial maintenance procedures, and execute procedures after flooring installation as recommended by flooring manufacturer.
2. Initial maintenance "Starter Kit" supplied by manufacturer. Initial maintenance to be conducted by flooring contractor.
3. Drying Room Yellowing: Expose installed linoleum to either natural or artificial light to allow "drying room yellowing" (the film is a natural occurrence of the oxidation of the linseed oil in linoleum products) on installed linoleum flooring to disappear prior to initiating temporary protection procedures.
4. Cover floor tile until Substantial Completion.

END OF SECTION 096519
SECTION 096813 – TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes Tile and Broadloom Carpeting
      1. See Finish Schedule/Plan and Finish Key.

1.2 PREINSTALLATION MEETINGS
   A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. Shop Drawings: Show the following:
      1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
      2. Carpet type, color, and dye lot.
      3. Type of subfloor.
      4. Type of installation.
      5. Pattern of installation.
      6. Pattern type, location, and direction.
      7. Pile direction.
      8. Type, color, and location of insets and borders.
      9. Type, color, and location of edge, transition, and other accessory strips.
     10. Transition details to other flooring materials.
   C. Samples: For each exposed product and for each color and texture specified.
      2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch-long Samples

1.4 INFORMATIONAL SUBMITTALS
   A. Product test reports.
   B. Sample warranty.
1.5 CLOSEOUT SUBMITTALS
   A. Maintenance data.

1.6 QUALITY ASSURANCE
   A. Installer Qualifications: An experienced installer who is certified by the
      International Certified Floorcovering Installers Association at the Commercial II
      certification level.
   B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to
      those of assemblies tested for fire response according to NFPA 253 by a
      qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING
   A. Comply with CRI 104.

1.8 FIELD CONDITIONS
   A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

1.9 WARRANTY
   A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace
      components of carpet tile installation that fail in materials or workmanship
      within specified warranty period.
      1. Warranty does not include deterioration or failure of carpet tile due to
         unusual traffic, failure of substrate, vandalism, or abuse.
      2. Failures include, but are not limited to, more than 10 percent edge
         raveling, snags, runs, dimensional stability, excess static discharge, loss of
         tuft bind strength, loss of face fiber, and delamination.
      3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE
   A. Products: Subject to compliance with requirements, provide the following:
      A. CPT1:
          Size: 24" x 24" Carpet Tile
          Manufacturer: Shaw Contract Group
          Style Name: Construct
B. Performance Characteristics: As follows:

1. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D 7330.
2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
4. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
5. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
6. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
7. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) according to AATCC 16, Option E.
8. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

C. Applied Treatments:

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
   1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Tackless Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI's "Carpet Installation Standard."
   1. As required for Broadloom.

D. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
   1. As required for Broadloom.

PART 3 - EXECUTION

3.1 INSTALLATION - TILE

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710.

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

D. Preparation: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

E. Installation: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

F. Installation Method: As recommended in writing by carpet tile manufacturer.
G. Maintain dye lot integrity. Do not mix dye lots in same area.

H. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

I. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

J. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

K. Install pattern parallel to walls and borders.

L. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.

M. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

END OF SECTION 096813
SECTION 099123 – INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior and interior substrates:
   1. Concrete masonry units (CMU).
   2. Steel.
   4. Wood.
   5. Gypsum board.

B. Refer to Division 05 Section “Metal Fabrications” for items to receive shop powder coat finish.

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 DESCRIPTION OF WORK

A. Extent of painting work is indicated on drawings and schedules, and as herein specified.
   1. Architectural paints. (noted “PNTD” on Finish Schedule)
B. Work includes painting and finishing of interior and exterior exposed items and surfaces throughout Project, except as otherwise indicated.
   1. Identification of fire rated walls: At fire rated walls, provide 1 inch high painted stencil lettering above finished ceilings and at ceiling access doors. Locate lettering at 8'-0" (max) horizontal intervals on both sides of concealed walls. Lettering shall read: “FIRE RATED ASSEMBLY” – WITH RATED DESIGNATION (all caps) in fluorescent “safety” orange paint color.
      a. Lettering is not required at fire rated walls that are exposed to view (spaces without finished ceilings/exposed construction).
      b. Refer to the Life Safety Plans and Partition types for rated wall locations; and reflected ceiling plans for concealed rated wall locations
   2. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.
   3. Painted Patterns and Accent Colors: Location of multi-color paint patterns and accent color areas are indicated in “Interior Accent Color Paint Schedule" on Drawings.

C. Work includes field painting of exposed bare and covered pipes and ducts, and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work. (Labeling on pipes and ducts, including possible stencil lettering, is included in Division 15, 15b, 16 work.)

D. “Paint” as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers, fillers, & other applied materials whether used as prime, intermediate or finish coats.

E. Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors are designated in “schedules.” Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from standard colors or finishes available.

F. Following categories of work are not included as part of field-applied finish work.
   1. Pre-Finished Items: Unless otherwise indicated, do not field-paint items specified for factory- or installer-finishing; such as toilet enclosures, acoustic materials, architectural woodwork, mechanical and electrical equipment, switchgear and distribution cabinets.
   2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, and pipe spaces, and elevator and duct shafts.
3. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.

4. Operating Parts: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts will not require finish painting.

G. Following categories of work are included under other sections of these specifications.
   1. Shop Primers: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.
   2. Unless otherwise specified, shop priming of fabricated components such as architectural woodwork, wood casework and shop-fabricated or factory-built mechanical and electrical equipment or accessories is included under other sections of specifications.

H. Do not paint over any code-required labels, such as Underwriters’ Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer’s technical information including Paint label analysis and application instructions for each material proposed. Include paint system schedule in the format used in this specification section. Samples: For each finish and for each color and texture required.

   1. Include Printout of current “MPI Approved Products List” for each product category specified, with the proposed product highlighted.
   2. For DTM, provide the following performance data.
      a. Abrasion Resistance test data per ASTM D4060 with CS-17 wheel, 1000 gram load for 1000 cycles. (CS-10 wheel data not acceptable).
      b. Direct Impact Resistance test data per ASTM D2794.
      c. Adhesion test data per ASTM D4541.

B. Color Chips: Submit color chips of manufacturer’s complete range of colors for each paint type for Architect’s review of color and texture (sheen). These will be used for initial color selection if the submitted range is adequate.

   1. Based on products of the selected manufacturer and paint systems specified in this Section, the Architect will prepare an initial color schedule indicating paint colors to be used in each space. The Architect will indicate required colors by referencing the selected paint manufacturer’s color chips, or by referencing drawdowns or other standard (such as “match laminate color”).
2. Provide 8-1/2 x 11 inch color samples ("drawdowns") for all paint colors and sheens for which the color in Architect's color schedule is not indicated by colors of the selected paint manufacturer for approval prior to application in the field. Provide paint drawdowns in finish sheens applicable to those in the field.

C. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Provide primers, other undercoat paint, and finish coat products produced by same manufacturer for each paint system. Use only thinners approved by paint manufacturer, and use only within recommended limits.

B. Coordination of Work: Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

C. Field Samples: On designated wall surfaces and other interior components, duplicate finishes of prepared samples. Provide full-coat finish samples on at least 100 sq. ft. of surface until required sheen, color and texture are obtained; simulate finished lighting conditions for review of in-place work.

D. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."


E. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

   a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).

   b. Other Items: Architect will designate items or areas required.
2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
3. Final approval of color selections will be based on benchmark samples.
   a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.6 DELIVERY AND STORAGE

A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:
   1. Name or title of material.
   2. Manufacturer's stock number and date of manufacture.
   3. Manufacturer's name.
   4. Contents by volume, for major pigment and vehicle constituents.
   5. Thinning instructions.
   6. Application instructions.
   7. Color name and number.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue.

C. Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

1.7 JOB CONDITIONS:

A. Apply paints only when temperature of surfaces to be painted and surrounding air are between 50°F and 90°F for water-base paints; and between 45°F and 95°F for solvent-thinned paints, unless otherwise permitted by paint manufacturer's printed instructions.

B. Do not paint in snow, rain, fog or mist, or when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.
   1. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.
1.8 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents. Identify materials using Architect’s Color and Finish Schedule designations.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

2. Store materials, not in use, in tightly covered containers in a well-ventilated area away from ignition sources at a minimum ambient temperature of 45 deg F (7 deg C). Maintain storage containers in a clean condition, free of foreign materials and residue.

3. Do not store extra materials for longer than one (1) year from date of Substantial Completion.

4. Dispose of expired materials in accordance with local governmental regulations

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer’s full range.

2.2 ACCEPTABLE MANUFACTURERS:

A. (PT) Paint Manufacturer: Subject to compliance with requirements, provide products of one of the following. No additional manufacturers will be considered.

1. ICI Dulux Paints (formerly Devoe & Glidden, among others)
2. Benjamin Moore and Co. (Moore).
3. PPG Industries, Inc. (PPG)
4. The Sherwin-Williams Co. (S-W). (Duron, a regional division of S-W, is not acceptable)

2.3 BLOCK FILLERS

A. Interior/Exterior Acrylic Resin Block filler: MPI #4.
   1. VOC Content: E Range of E2.

2.4 CMU (EXPOSED) INTERIOR

A. Interior High-Solids Epoxy Polymide Coating: MPI #77.
   1. <400g/L

2.5 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.
   1. VOC Content: E Range of E1
   2. Environmental Performance Rating: EPR 1.

B. Exterior Latex Primer/Sealer: MPI #3

C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.6 METAL PRIMERS

A. Interior/Exterior Alkyd Anticorrosive Metal Primer: MPI #79.
   1. VOC Content: E Range of E1.

B. Waterborne Galvanized-Metal Primer: MPI #134.
   1. VOC Content: E Range of E1.
   2. Environmental Performance Rating: EPR 1.

2.7 WOOD PRIMERS

A. Interior Latex-Based Wood Primer: MPI #39.
   1. VOC Content: E Range of E1.
   2. Environmental Performance Rating: PR 1.
2.8 HIGH TRAFFIC PAINTS  
   1. Scuffmaster Armor, or equivalent

2.9 LATEX PAINTS
   
   A. Interior Latex (Flat): MPI #53 (Gloss Level 1).
      1. VOC Content: E Range of E1.  
         2. Environmental Performance Rating: EPR 0.5.
   
   B. Interior Latex (Low Sheen): MPI #44 (Gloss Level 2).  
      1. VOC Content: E Range of E1  
         2. Environmental Performance Rating: EPR 1.
   
   C. Interior Latex (Semigloss): MPI #54 (Gloss Level 5).  
      1. VOC Content: E Range of E1.  
         2. Environmental Performance Rating: EPR 2
   
   D. Exterior Latex (Semigloss): MPI#11 (Gloss Level 5)

PART 3 - EXECUTION

3.1 EXAMINATION
   
   A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
   
   B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
      1. Masonry (Clay and CMU): 12 percent.  
         2. Wood: 15 percent.  
         3. Gypsum Board: 12 percent.
   
   C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
   
   D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
      1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.
3.2 PREPARATION AND APPLICATION

A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
   1. Provide barrier coats over incompatible primers or remove and reprime as required. Notify Architect in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
   2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
   3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

B. Cementitious Materials: Prepare cementitious surfaces of concrete, concrete block, and cement plaster to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.
   1. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

C. Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, suitable solvent, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.
   1. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.
   2. When transparent finish is required, use specified sealer (varnish) for backpriming.

D. Comply with manufacturer’s written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

E. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

F. Do not paint pre-finished items unless indicated otherwise.

G. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

H. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:
   a. Uninsulated metal piping.
   b. Uninsulated plastic piping.
   c. Pipe hangers and supports.
   d. Tanks that do not have factory-applied final finishes.
   e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
   f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:
   a. Switchgear.
   b. Panelboards.
   c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

I. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

J. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.3 MATERIALS PREPARATION:

A. Mix and prepare painting materials in accordance with manufacturer's directions.

B. Maintain paint mixing and application containers in a clean condition, free of foreign materials and residue.
3.4 APPLICATION:

A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
   1. Provide access to representative of selected coating manufacturer for observation of material application only at all times during painting work. Unless specifically indicated by Architect, this representative shall have no authority to make decisions about the work.
   2. Paint surface treatments, and finishes, are indicated in "schedules" of Contract Documents.
   3. Provide finish coats that are compatible with prime paints used.
   4. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
   5. Paint surfaces behind movable and permanently fixed equipment and furniture.
   6. Paint interior surfaces of ducts visible through grilles, with flat, non-specular black paint.
   7. Paint back sides of access panels, and removable or hinged covers.
   8. Finish exterior and interior doors on tops, bottoms and side edges same as faces.
   9. Sand lightly between each succeeding enamel or varnish coat.
  10. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless required to prevent "show-through" for finish topcoats.

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

C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish total DFT indicated or as recommended by coating manufacturer.
D. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces. Do not paint prefinished equipment items.

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

F. Finish Coats: Provide finish quality for new and repainted surfaces as follows:
   1. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.
   2. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.
   3. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.5 CLEAN-UP AND PROTECTION:

A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or damage finished surfaces.

B. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work until date of Substantial Completion. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
   1. Provide “Wet Paint” signs to protect newly-painted finishes. Remove temporary protective wrappings provided by others for their work after completion of painting.

C. At completion of work of other trades, touch-up & restore all damaged painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. General: Provide the following Paint systems for the various substrates, as indicated.
B. Zinc-Coated or Zinc-rich Primer-Coated Metal with Direct to Metal ("DTM") Gloss Acrylic  
Enamel Finish: 2 topcoats of DTM gloss enamel over primer, with min. total DFT of 2.5 mils. 
1. Prime Coat (Tie-Coat): Lead-free, acrylic base interior/exterior galvanized metal primer, premium grade. Apply over shop primer.  
   a. ICI  4020 Devflex DTM Flat Interior/Exterior Waterborne Primer  
   b. Moore: M04 Acrylic Metal Primer  
   c. PPG  90-712 Pitt-Tech Int/Ext Primer/Finish Industrial Enamel  
2. First and Second Coats: DTM Acrylic Gloss Enamel.  
   a. ICI  4208 Devflex Int/Ext Waterborne Acrylic Gloss Enamel  
   b. Moore: M28 Acrylic Gloss Enamel  
   c. PPG  90-374 Pitt-Tech Int/Ext High Gloss Industrial Enamel  
   d. S-W: B66 W100 DTM Acrylic Coating (Gloss)  

3.7 INTERIOR PAINTING SCHEDULE  
A. General: Provide the following paint systems for the various substrates, as indicated. Dry film thickness is noted as “DFT.” Provide compatibility test areas on existing painted substrates.  
B. CMU Substrates: (Exposed)  
1. Catalyzed EpoxyCoating System for New and Existing Interior CMU Walls:  
   a. Prime Coat: S-W Heavy Duty Block Filler B42W46 (18 mils wet, 10 mils dry)  
   b. Prime Coat: (at existing, previously painted walls): clean surface to receive new finishes.  
   c. Intermediate Coat: S-W Waterbased Tile-Clad Epoxy Finish, B73-100 Series. (2-4 mils dry per coat).  
   d. Topcoat: S-W Waterbased Tile-Clad Epoxy Finish, B73-100 Series. (2-4 mils dry per coat).  
C. CMU Substrates: (not exposed)  
1. Latex System: MPI INT 4.2A.  
   c. Topcoat: Interior latex (low sheen).  
D. Steel Substrates:  
1. High-Performance Architectural Latex System MPI INT 5.1R:
a. Prime Coat: Primer, alkyd, quick dry, for metal, MPI #76.
c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.

E. Galvanized-Metal Substrates:
   1. High-Performance Architectural Latex System MPI INT 5.3M:
      a. Prime Coat: Primer, galvanized, water based, MPI #134.
      c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.

F. Aluminum (Not Anodized or Otherwise Coated) Substrates:
   1. High-Performance Architectural Latex System MPI INT 5.4F:
      a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
      c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.

G. Wood Substrates: Wood trim Architectural, woodwork, Doors, and wood board paneling.
   1. Latex over Alkyd Primer System MPI INT 6.3U:
      a. Prime Coat: Primer sealer, alkyd, interior, MPI #45.
      c. Topcoat: Latex, interior (MPI Gloss Level 3), MPI #52.

H. Gypsum Board Substrates:
   1. Latex System: MPI INT 9.2A.
      c. Topcoat: Interior latex
         1) Ceilings (flat)
2) Walls (low sheen).

I. Gypsum Board walls located at Lobby 102 and Corridor 105:
   1. Provide High Traffic paint coating
   2. Provide Scuffmaster Armor, or equivalent (custom color to match paint at nearby new CMU walls.)

J. Cotton or Canvas Insulation-Covering Substrates: Including pipe and duct coverings.
   1. Latex System: MPI INT 10.1A.
      c. Topcoat: Interior latex (flat).

K. (Stained woodwork with transparent finish is specified in Division 6 by woodworker.)

3.8 3.5 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Division 15, Division 16, and Division 17 for schedule of color coding of equipment, duct work, piping, and conduit.

B. Paint shop-primed equipment, where indicated.

C. Remove unfinished louvers, grilles, cover, and access panels on mechanical and electrical components and paint separately.

D. Finish equipment, piping, conduit, and exposed duct work in utility areas in colors according to the color coding scheme indicated.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.9 3.6 SCHEDULE – SURFACES TO BE FINISHED

A. Paint all exposed surfaces in areas indicated to receive work whether or not designated in finish schedules. Where items or surfaces are not specifically mentioned, paint same as adjacent similar materials or areas.

B. Do Not Paint or furnish the following items:
   1. Items fully factory finished or where natural finish of material is noted, unless other noted.
   2. Stainless Steel Items.
C. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
   1. Paint all insulated and exposed pipes occurring in finished areas to match background surfaces, unless otherwise noted.
   2. Paint shop-primed items occurring in finished area.
   3. Paint interior surfaces of air ducts and convectors and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to fusible surfaces.
   4. Paint dampers exposed behind louvers, grilles, and connector and baseboard cabinets to match face panels. (unless this hinders fire dampers performance)

D. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

3.10 3.7 SCHEDULE – COLORS

A. The Architect will issue a color schedule that will designate surface colors and locations of those colors. Contractor shall allow up to 20% accent walls. Different materials in the same room may be designated to receive different colors. Similar materials in the same room may be designate to receive different colors.
SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Room-identification signs.
   2. Construction Sign

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Include plans, elevations, sections, details and attachments to other Work.
   1. Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.
   2. Provide message list for each sign, including large-scale details of wording, lettering and Braille layout.

C. Samples: For each sign material indicated that involves color selection.

1.3 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ’s "2010 ADA Standards for Accessible Design" and ICC A117.1.

1.4 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 PANEL SIGNS

A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

B. Manufacturers:
   1. Allenite Signs; Allen Marking Products, Inc.
   2. Acorn Signs
   3. American Graphics Inc.
   4. Andco Industries Corp.
   5. APCO Graphics, Inc.
   6. ASI Sign Systems, Inc.

C. Room-Identification Signs: Provide room identification signs for all new and renovated spaces. Sign system with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
   1. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated over subsurface graphics to acrylic backing sheet to produce composite sheet.
      a. Composite-Sheet Thickness: 0.125 inch (3.18 mm).
      c. Color(s): As selected by Architect from manufacturer's full range.
      a. Edge Condition at Vertical Edges and at Horizontal Edges: Square cut.
      b. Corner Condition in Elevation: Rounded.
      a. If mounted on glass, a blank panel on opposite side shall be provided.

D. Graphic Content and Style: Provide signs and sign copy that comply with requirements of ANSI A117.1-2003 ADA Accessibility Guidelines and as indicated:
   1. Font: Arial
   2. Font Height: 1 inch
   3. Panel Size: (examples)
a. Men’s and Women’s Toilets: 12" W X 12" H
b. Storage: 8" W X 3" H
c. Electric Closet: 8" W X 3" H
d. Allowable Occupant Load (All Meeting Spaces) 8" W X 3" H
e. Typical Room ID: Space Name; 8" W X 3" H

4. Content:

a. Men’s and Women’s Toilets: Characters, Braille and Pictogram
b. Storage: Characters and Braille
c. Electric Closet: Characters and Braille
d. Allowable Occupant Load, Characters and Braille (All Meeting Spaces)
e. Space Name; Characters and Braille
   1) “Staff Only” Areas: Include Character and Braille for “Staff Only” at signs for spaces that separate all Public from Staff Areas.

E. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.
   2. Raised-Copy Thickness: Not less than 1/32 inch (0.8 mm).

F. Colored Coatings for Acrylic Sheet: For copy colors, provide Pantone Matching System (PMS) colored coatings, including inks and paints, which are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for application intended.

2.2 ACCESSORIES

A. Mounting Methods: Use double-sided vinyl tape fabricated from materials that are not corrosive to sign material and mounting surface.

2.3 CONSTRUCTION SIGN

A. Contractor shall provide and install a 4’x8’ color printed exterior sign. Sign to be mounted on 4x8 sheet of painted exterior grade 3/4 inch plywood, and painted pressure treated 4x4 wood posts. Sign design / Graphics to be provided by Architect. Sign location to be determined by Architect and Owner.
PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer’s written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.

2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door.


B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:

1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.

END OF SECTION 101400
SECTION 104413 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Portable fire extinguishers.
   2. Fire-protection cabinets for Portable fire extinguishers.
   3. Fire-protection accessories. (wall mounting brackets)
   4. Emergency key access box. (install salvaged knox box from existing school, provided by the owner).

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
C. Samples: For each exposed product and for each color and texture specified.
D. Maintenance data.

1.3 QUALITY ASSURANCE

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
B. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
B. Stainless Steel Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304
C. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).
2.2 FIRE PROTECTION CABINET & FIRE EXTINGUISHER

A. Cabinet Type for Typical: “Basis of Design “Product is J. L. Industries, Inc, Panorama suitable for Cosmic 5E with 2A-10BC fire extinguisher to be provided by Contractor at substantial completion. Provide quantity shown on drawings.
   1. Style:
      a. Recessed at Gypsum wall assembly.
      b. Semi-Recessed at CMU wall assembly.

B. Wall Brackets for Fire Extinguishers as indicated in Mechanical, Electrical, Data rooms: “Basis of Design Product: J. L. Industries, Inc, MB818C/A, suitable for Cosmic 5E with 2A-10BC fire extinguisher to be provided by Contractor at substantial completion.


D. Equal products of the following manufacturers will be considered:
   a. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
   b. Larsen’s Manufacturing Company.

E. Cabinet Construction: As required by rating of adjacent construction.

F. Cabinet Material: Steel sheet.

G. Semi-recessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semi-recessed cabinet installation.
   1. Square-Edge Trim: 1-1/4- to 2-1/2-inch (32- to 38-mm) backbend depth.


I. Door Material: Stainless sheet.

J. Door Style: Fully glazed panel with frame. (no glazing as Security/Detention)

K. Door Glazing: Tempered float glass (clear). (no glazing as Security/Detention)

L. Door Hardware: Manufacturer’s standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
   1. Security Detention Cabinet: Provided option Mortise Deadbolt Installed. Provide blank core construction and blank keys, to be keyed on site by installer and coordinated with Owner for keying requirements..
M. Accessories:
   1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
   2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
   3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
      a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
         1) Location: Applied to cabinet glazing.
         3) Lettering Color: Red.
         4) Orientation: Vertical.

N. Finishes:
   1. Manufacturer's standard baked-enamel paint for interior of cabinet and door.
      a. Color: As selected by Architect from full range of industry colors and color densities.
   2. Exterior of cabinet, door, and trim; 304 stainless steel.

2.3 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Miter and weld joints and grind smooth.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed and prepare recesses as required by type and size of cabinet and trim style.

B. Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

C. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
D. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413
SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   2. Manual Roller Shades
   3. Shade accessories.
   4. Control systems.

B. See Division 16 Sections for electrical service and connections for motorized shade operation.

C. Refer to Division 01 Section , Alternates, for deductive alternates.

1.2 SUBMITTALS

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

B. Shop Drawings: Include plans, elevations, sections, details, details of installation, operational clearances, wiring diagrams, and relationship to adjoining Work.
   1. Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.
   2. Shop drawing details shall show all context and adjacent construction and materials.
   3. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.
   4. Include drawings, details and wiring diagrams for all control stations, including those in the floor boxes to be controlled at the A/V stations.

C. Coordination Drawings: Drawn to scale and coordinating penetrations and ceiling-mounted items.

D. Samples: For each exposed finish and for each color and texture required.

E. Window Treatment Schedule: Use same designations indicated on Drawings.

F. Maintenance data.
1.3 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Fire-Test-Response Characteristics: Provide products passing flame-resistance testing according to NFPA 701 by a testing agency acceptable to authorities having jurisdiction.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with WCMA A 100.1.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

   1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS


B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Draper Inc.
   2. MechoShade Systems, Inc.

2.2 ROLLER SHADES

A. Motorized Operating Mechanisms: Provide factory-assembled shade-operator systems of size and capacity and with features, characteristics, and accessories suitable for conditions indicated and recommended by manufacturer for use with shades indicated. See drawings and details on Reflected Ceiling Plan Sheet A10.01, Building Sections and Detail, and Electrical Drawings.

   1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Electric Motors: Manufacturer's standard line in voltage for operating roller shades.
   a. Electrical Characteristics: Single phase, 110 V-120v, 60 Hz.
   b. Motor inside roller tube as standard.

3. Single-Shade bracket mount type:
   a. Includes:
      1) Solar Shade Cloth
         a) Hem bar sealed inside cloth

4. Remote Programmable Controls: Group wall-switch control stations with programmable controls. This will be coordinated with the Audio / Visual System. Shade provider shall include a low voltage control interface so the shades may be controlled via contact closure.
   a. “Basis of Design” for control interface:
      1) IntelliFlex SPGC4 – Gen3 Controller, by Draper

5. Crank-Operator Override: Crank and gearbox operate shades in event of power outage or motor failure.


B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

   a. Loop Length: Full length of roller shade.
   b. Limit Stops: Provide upper and lower ball stops.
   c. Chain-Retainer Type: Clip, jamb mount.

   a. Provide for shadebands that weigh more than [10 lb (4.5 kg)] or for shades as recommended by manufacturer, whichever criteria are more stringent.

C. Crank-and-Gear Operating Mechanisms: Sealed gearbox drive system controlled by crank handle. (provide crank operated shades at shades mounted above 10 feet- if the Deduct Alternate for deleting the motorized shades is accepted).

1. Crank-Handle Type: Detachable.
2. Crank-Handle Length: Manufacturer's standard.
D. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Mounting Configuration: Single roller (at doors and interior windows)
   Double roller, offset with outside roller over and inside roller under (at Large Conference Room exterior windows, including shade and blackout).
2. Roller Drive-End Location: Right side of inside face of shade.
3. Direction of Shadeband Roll: Regular, from back of roller.

E. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

F. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L-shaped.
   b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 3 inches (76 mm).

2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
   a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 3 inches (76 mm).

3. Endcap Covers: To cover exposed endcaps.
4. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
   a. Height: Manufacturer's standard height required to enclose roller and shadeband or shadebands when shade is fully open, but not less than 5 inches (127 mm) height for single roller or 7.625 inches for
double rollers, indicated on Drawings. Contractor to verify pocket height with selected manufacturer for overall window height and roller sizes.

b. Provide pocket with lip at lower edge to support acoustical ceiling panel.

5. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
   a. Closure-Panel Width: As indicated on Drawings.

6. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.

7. Installation Accessories Color and Finish: As selected from manufacturer’s full range.

2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
   2. Type: Woven polyester and PVC-coated polyester.
   4. Roll Width: As required to match openings.
   5. Openness Factor: 5 percent.
   6. Color: As selected by Architect from manufacturer’s full range.

2.4 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
   1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).
2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:

   1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

   2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 ROLLER-SHADE INSTALLATION

   A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.

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

   C. Install roller shades level, plumb, and aligned with adjacent units, according to manufacturer's written instructions.

   D. Electrical Connections: Connect motor-operated roller shades to building electrical system.

   E. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

   F. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

END OF SECTION 122413
SECTION 124813 - FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. This Section includes the following:
      1. Recessed Entry Mats (indicated on drawings as “REM”). Shall be carpet type and in a 1/2inch recessed frame. Located in Vestibule 101.

1.3 SUBMITTALS
   A. Product Data: Include manufacturer's specifications and installation instructions, construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of floor mat and frame specified.
   B. Shop Drawings: For floor mats and frames. Show assembly, joint locations, installation details, layout, plans, sections, accessories, anchors, and attachments to other Work.
      1. Coordinate Shop Drawings showing oversized recess for deferred installation of frames with concrete work.
   C. Samples for Initial Selection: For each type of floor mat and frame indicated.
   D. Samples for Verification: 12-inch- square assembled sections of floor mats, frame members, and tread rails with selected tread surface showing each type of metal finish and color of exposed floor mats, tread rails, frames, and accessories required.
   E. Maintenance Data: For cleaning and maintaining floor mats to include in maintenance manuals.

1.4 QUALITY ASSURANCE
   A. Source Limitations: Obtain floor mats and frames from a single manufacturer.
   B. Accessibility Requirements: Provide installed floor mats that comply with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's “Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG).”

1.5 PROJECT CONDITIONS
   A. Field Measurements: Verify blocked-out openings in floors by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating floor mats and frames without field measurements. Coordinate floor construction to ensure that actual opening dimensions correspond to established dimensions.

1.6 COORDINATION

A. Coordinate size and location of oversized recesses in concrete work to receive floor mats and frames. Defer frame installations until building enclosure is completed and related interior finish work is in progress. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate integral installation of recessed frames and anchors with placing of concrete slab so frames are positioned accurately.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The design for each type matt is based on the Construction Specialties, Inc. product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

1. Recessed Entry Mats (framed):
   a. Arden Architectural Specialties, Inc.
   b. Balco, Inc.
   c. Construction Specialties, Inc.
   d. Pawling Corporation.
   e. Reese Enterprises, Inc.

   “Basis of Design” Product: Construction Specialties: DesignStep: Duration [DRTN], carpet with 1/2inch Tapered Angle [TNG].

2.2 METAL FRAME MATERIALS

A. Extruded Aluminum: ASTM B 221, alloy 6061-T6 or alloy 6063-T5, T6, or T52 as standard with manufacturer.

2.3 CONCRETE FILL AND GROUT MATERIALS

A. Provide concrete materials complying with Division 3 for grout and fill around and under recessed mats and frames that produce concrete equivalent in strength to cast-in-place concrete slabs. For concrete fill, adjust aggregate size to not exceed one-third fill thickness.

2.4 FLOOR MATS

A. General: Provide colors, patterns, and profiles selected by Architect from manufacturer’s standards.
2.5 FABRICATION
   A. General: verify sizes by field measurement before shop fabrication.
   B. Floor Mats: Shop fabricate units to greatest extent possible in sizes as indicated. If not otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.
   C. Recessed Metal Mat Frames (Interior): Extruded aluminum, of size and style to fit floor mat type specified, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.
      1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.
   D. With manufacturer's standard protective coating, coat surfaces of aluminum frames that will contact cementitious material.

2.6 FINISHES, GENERAL
   A. Comply with NAAMM's “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.
   B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.7 ALUMINUM FINISHES
   A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
   B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine substrates, floor conditions, and floor recesses for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.
      1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. Install recessed mat frames to comply with manufacturer's written instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate top of mat surfaces with bottom of doors that swing across mats to provide clearance for door operation.
   1. Install necessary shims, spacers, and anchorages for proper location and secure attachment of frames.
   2. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.

B. Install surface-type units to comply with manufacturer's written instructions at locations indicated; coordinate with entrance locations and traffic patterns.
   1. Anchor fixed surface-type frame members to floor with devices spaced as recommended by manufacturer.

3.3 PROTECTION
A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.
B. Defer installation of floor mats until Project is near Substantial Completion.

END OF SECTION 124813
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DIVISION 15A

PLUMBING WORK

1. WORK INCLUDED

A. The work includes furnishing all supervision, labor, materials and equipment necessary for and reasonably incidental to the installation of all plumbing work as shown on drawing Sheets P0.1 through P1.3, and as specified herein.

B. All work shall be installed in accordance with the 2012 edition of the Virginia Uniform Statewide Building Code.

C. All equipment and materials shall be installed in accordance with the manufacturers’ recommendations. All equipment and materials shall be new unless noted otherwise on the drawings or in the specifications.

D. Perform all plumbing demolition work shown on the demolition drawings or required to install the new work. Remove all demolished equipment and materials from the site.

2. INTENT OF DRAWINGS

A. The drawings are diagrammatic only, intending to show general runs and locations of piping and equipment, and do not necessarily show all required offsets and details. All work shall be accurately laid out with reference to the drawings and in cooperation with other trades to avoid conflicts and to obtain a neat and workable installation which will afford maximum accessibility for operation, maintenance and headroom.

B. The drawings are not intended to be rigid in specific details. Where they are in conflict with requirements of other drawings, or with any applicable codes or with recommendations of the manufacturers of any equipment furnished, installed or connected, make such adjustments as may be required to ensure that all such equipment installed and connected is in conformance with such codes or recommendations, for the safe, proper and efficient operation of the equipment.

3. SUBMITTALS

A. Manufacturers’ engineering data describing materials and equipment to be used in the construction work shall be submitted to the Architect for review by the Engineer. The Engineer’s review of the engineering data will
cover only general conformity of the data to the requirements of the specifications.

B. Engineering data shall be submitted on the following:

1. Hangers and supports
2. Valves
3. Pipe insulation
4. Roof drains and cleanouts
5. Plumbing fixtures and trim
6. Domestic water heater
7. Firestopping

C. The reviewing of the submittals shall not relieve the Contractor from complying with the drawings and specifications.

4. PIPING WORK

A. Generally, all piping shall be concealed above suspended ceilings, behind furring, and wherever it is practicable to conceal it from view. In spaces without ceilings, the piping shall be run exposed.

B. All piping shall be run to true alignment, generally parallel or perpendicular to adjacent building walls, floors and ceilings, with uniform grades and spacing so as to present a neat and workmanlike appearance.

C. Care shall be paid to the exact locations of all piping and equipment, with respect to equipment, ducts, lights, conduit, slabs, beams and columns, etc., so as to provide maximum access to all mechanical and electrical materials. Close coordination and cooperation shall be exercised with other trades in locating the piping and equipment in the best interest of the Owner. The drawings and specifications covering other work to be done in the building shall be carefully studied, and arrangements shall be made to avoid conflict.

D. The drawings shall be followed where they are definite and provided such procedure causes no objectionable conditions or does not conflict with other trades, laws, regulations, or recommendations of equipment manufacturers. The drawings are intended to indicate the size of piping connections, and if certain sizes are omitted or unclear, obtain additional information before proceeding.

E. Rough in for equipment requiring connections to the plumbing systems. Obtain all necessary data on locations, sizes, connections, fittings, and ar-
rangements required to assure the proper installation of all equipment requiring plumbing connections before roughing-in for same.

F. Not all necessary pipe offsets are indicated on the Drawings because of the small scale. Study the various runs of piping to be installed and make such adjustments in exact routings as may be required for proper installation.

G. Bushings shall be avoided, and reducing fittings shall be used wherever practicable.

H. The ends of all pipes shall be reamed clean, and all pipes shall be straightened before erection. All pipes shall be clean inside before erection, and measures shall be taken to preserve this cleanliness after erection.

I. Grade all piping for drainage through the equipment or through accessible hose bibb drain valves at low points so that the system can be completely drained by gravity flow.

J. Extend the existing domestic hot and cold water system and make all connections to all plumbing fixtures and other equipment requiring same. Connect the new cold water line to the existing cold water line where shown on the drawings.

1. Verify all connection sizes to the fixtures actually furnished. Local fixture connections shall be full size of the fixture fittings. All runouts serving fixtures shall be as shown or at least one full pipe size larger than the fixture fittings, and shall in no case be smaller than the fixture fittings. Install shutoff valves at all connections to fixtures and equipment.

2. Extend the top of each individual fixture water connection full size to form an air chamber not less than 12 inches long, wherever possible, and cap at the top.

3. All low points in water piping which cannot be drained through fixture faucets shall be fitted with hose bibb drain valves.

4. Grade all domestic water piping with a minimum slope of 1 inch in 40 feet down to the drain valves.

K. Extend the existing soil, waste and vent piping system to serve all fixtures, drains and other equipment requiring same.
1. Grade all horizontal soil and waste piping with a slope of 1/8 inch per foot. Arrange the vents so that the flow of air to the outside will be continuously upward and so that low points will be drained.

L. Provide a storm drainage system as shown on the drawings.

M. Extend the existing natural gas piping system as shown on the drawings to serve Rooftop Unit No. 1 and other existing equipment.

5. INTERIOR PIPE AND PIPE FITTINGS

A. Domestic hot and cold water piping shall be hard drawn Type "L" copper, assembled using wrought copper type fittings and 95-5 solder.

B. Soil and waste piping shall be:

1. Hubless cast iron (no-hub) pipe and fittings, coated inside and out, CISPI-301. The joints shall be connected using either heavy duty Type 304 stainless steel couplings with four sealing clamps on pipes 1-1/2" through 4" in size and six sealing clamps on pipes 5" in size and larger and with neoprene sealing sleeves, equal to Husky SD 4000 as manufactured by Anaheim Foundry Co., or cast iron couplings consisting of two cast iron clamps, a neoprene gasket and stainless steel bolts and nuts, equal to MG Piping Products Co., or

2. Service weight cast iron hub and spigot soil pipe and fittings, coated inside and out, ASTM A-74, with the joints caulked with lead and oakum or with the joints sealed using double seal compression type gaskets, equal to Ty-Seal assembled with Lubri/Fast lubricant, or

3. Under the lowest floor only, Schedule 40 DWV type PVC, assembled using a compatible solvent cleaner and cement.

C. Vent piping shall be Schedule 40 DWV type PVC, assembled using a compatible solvent cleaner and cement.

D. Storm drainage and overflow piping shall be Schedule 40 DWV type PVC with all-hub fittings and solvent cleaner and cement.
E. Gas piping shall be Schedule 40 black steel pipe, ASTM A53, assembled with welded joints and black steel fittings.

F. Copper pipe and copper fittings shall be cleaned immediately prior to assembly. A lead-free flux recommended by the solder manufacturer shall be applied to both the pipe and the fittings.

G. All copper pipes shall be provided with di-electric adapters where they connect to steel pipe.

6. VALVES

A. Drain valves shall be bronze two-piece ball valves with 3/4" hose cap and drain, equal to NIBCO Fig. T-585-70-HC.

B. Domestic hot and cold water shutoff valves 2-1/2" and smaller shall be bronze two-piece ball valves with conventional port, blowout proof stem, chrome-plated bronze ball, adjustable packing gland, and reinforced TFE seats, equal to NIBCO Fig. T-580-70. Provide valve stem extensions, if required, so that the operators will operate freely without damaging the insulation or jacket.

C. Provide manual air vents at the high points in the piping.

D. Provide accessible AGA-approved gas cocks for each gas-fired piece of equipment.

E. Provide hose bibb drain valves at all low points in the domestic hot and cold water system. These valves shall be fitted with caps and chains.

7. HANGERS AND SUPPORTS

A. In general, horizontal piping shall be supported from walls, beams, columns and slabs using appropriate hangers or supported by beam clamps, side beam brackets, wall brackets, structural steel angles or channels, or other approved arrangements to suit installation conditions. All piping shall be hung free of dependence on pipe sleeves for support.

B. All piping shall be hung to true alignment, using appropriate and substantial hanger arrangements. Wire and strap hangers will not be permitted. Hangers shall be located so that piping and hangers will be clear of other piping, hangers, conduits, lighting fixtures, equipment, ceiling suspension systems, structural members, ductwork and other obstructions.
C. All suspended piping shall be supported using steel extended clevis hangers where this is practical. Where the use of clevis hangers is not practical, e.g., between floor joists, the piping shall be supported using 2"x4" wood blocking. The hangers for hot and cold water service shall be fitted with insulation protection shields large enough to support the insulation.

D. Vertical hot and cold water risers shall be supported using copper-coated riser clamps at each floor, equal to B-Line Fig. B3373CT. Vertical vents shall be supported using riser clamps at each floor; the riser clamps shall be appropriate to the type of pipe used.

E. Hanger rods shall be of steel and not less in diameter than 3/8 inch for pipe 2 inches and smaller and ½ inch for pipe 2-1/2 inches and larger.

F. Maximum pipe hanger spacing shall not exceed the following:

1. 36" o.c. for ½” through 1-1/4” PVC and CPVC plastic pipe, unless otherwise recommended by the manufacturer.
2. 5 feet o.c. for ½” through 3/4” copper pipe and for PVC and CPVC pipe 1-1/2” through 2” in size, unless recommended otherwise by the manufacturer.
3. 7 feet o.c. for ½” through 1” steel pipe and 1” copper pipe.
4. 8 feet o.c. for 1-1/2” cast iron and steel pipe and 1-1/4” through 2” copper pipe.
5. 10 feet o.c. for 2” and 2-1/2” cast iron and steel pipe and 2-1/2” and 3” copper pipe.
6. 12 feet o.c. for 3” cast iron and steel pipe and 4” copper pipe.
7. 14 feet o.c. for 4” and larger cast iron and steel pipe and 6” and larger copper pipe.

8. PIPE INSULATION

A. All pipe insulation shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50. Pipe insulation shall be as manufactured by Owens-Corning Fiberglas, CertainTeed, Knauf or Manville. All insulation shall be installed in a neat and workmanlike manner.
B. Pipe insulation shall be either:

1. Heavy density one-piece sectional pipe insulation jacketed with an embossed vapor barrier laminate, equal to Owens-Corning Fiberglas ASJ/SSL-II. The jacket shall have a pressure sealing lap adhesive to eliminate the use of staples, adhesives and bands.

2. Flexible elastomeric thermal insulation, equal to Armacell AP Armaflex or AP Armaflex/SS. The insulation shall be sealed completely to prevent condensation from forming.

C. Domestic hot and cold water pipes shall have 3/4” thick insulation. Storm drain pipes shall have 1” thick insulation.

D. No pipes shall be insulated until they have been tested and had leaks sealed.

E. The longitudinal seams in all service jackets shall overlap and shall be vapor sealed. Butt joints in straight runs shall be vapor sealed with joint sealing strips. Where insulation abuts hanger inserts, the butt ends shall be vapor sealed and the joint shall be sealed with a joint sealing strip. On cold water piping, the sheet metal overlap of the hanger insert shall also be sealed with a joint sealing strip.

F. Insulate the hot and cold water pipes, and the trap and valves under the sinks, with insulation kits conforming to ADA requirements. Each insulation kit shall be a specially-designed, fully-molded, flexible vinyl insulation system to cushion impact and provide a good insulator against burns. They shall be white or off-white in color.

G. Existing insulation and jackets on existing piping which are damaged while installing the new work shall be repaired to match the existing conditions at no additional cost to the Owner.

9. ROOF DRAINS AND CLEANOUTS

A. Provide all roof drains, overflow roof drains and downspout nozzles as shown and scheduled on the drawings.

B. Provide all cleanouts required for the sanitary sewer system and storm drainage system, as shown and scheduled on the drawings. The sizes of all cleanouts shall be the same as the drain pipe sizes on the drawings, up to a maximum size of 4”. Long sweep elbows shall be installed at all cleanouts located in floors. Extension pieces and bodies of cleanouts
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shall be of cast iron and shall be arranged to suit each condition of application. The cleanouts shall be constructed of cast iron with bronze plugs.

C. Set all cleanouts located in floors level and at the same elevations as the finished floor line. Set the inside faces of covers on cleanouts located in walls even with the outside face of the finished wall. There shall be no gaps at the floor or wall between the floors or walls and the cleanouts or cleanout covers, respectively.

D. Where caulk outlets are specified, no hub outlets or "speedi-set" outlets may be used as best suits the installation.

10. PLUMBING FIXTURES AND TRIM

A. Provide all plumbing fixtures and equipment as shown and scheduled on the drawings. They shall be provided with all necessary stops, valves, traps, supplies and appurtenances required.

B. Every accessible individual water supply and gas connection to each fixture and piece of equipment shall be equipped with an accessible stop valve.

11. ELECTRIC WATER HEATER

A. Provide an instantaneous electric water heater as shown and scheduled on the drawings.

12. PIPE IDENTIFICATION MARKERS

A. All piping shall be marked using either stenciled lettering or snap-on manufactured pipe markers with contrasting lettering and background on pipes with white canvas jackets. For pipes up to 1", use 1" high letters. For pipes from 1" to 2", use 2" high letters. For pipes over 2", use 3" high letters. Pipes shall generally be marked 50' on center and at the connections to all equipment.

B. Provide stenciled or snap-on manufactured pipe marker directional arrows for all new piping to indicate the direction of flow. The arrows shall occur at all changes in direction of the pipes and every 25' on center between changes in direction. Arrows need not be provided at multiple changes in direction adjacent to each other.
C. Domestic hot and cold water pipes shall be marked with the letters "DHW" and "DCW", respectively.

13. SLEEVES

A. Where pipes pass through masonry or concrete walls or floors, the wall or floor openings shall be fitted with Schedule 40 steel pipe sleeves the full thickness of the walls or floors and grouted in place. Sleeves shall be of a diameter that will admit passage of the pipe and insulation.

B. Sleeves will not be required on horizontal exposed local connections through walls to fixtures and equipment.

14. PLATES AND ESCUTCHEONS

A. All exposed pipes that pass through finished walls and ceilings of finished spaces shall be fitted with wall and ceiling plates. Plates and escutcheons shall not be installed in unfinished spaces.

B. Plates and escutcheons shall be sized to fit the bare pipe or insulation in a snug and neat manner. They shall be of sufficient size to cover the sleeved openings for the pipes. Escutcheons shall be stamped, chromium plated metal of set-screw design.

15. CLEANING, BLOWING OUT AND DISINFECTION

A. The plumbing equipment and piping shall be blown out under pressure and cleaned of foreign matter, through temporary connections where necessary, before the system is placed in service. Precautions shall be taken to prevent foreign matter from getting into the equipment and piping during construction. The lines shall be flushed with high volumes of water, using quick opening valves to create surges by opening and closing the valves. Clean the drains at all low points after the flushing has been completed.

B. After all of the domestic cold water and hot water piping has been flushed free of foreign matter, the piping shall be disinfected in accordance with the requirements of the Plumbing Code.

16. TESTING

A. All plumbing equipment and piping shall be tested and found tight. Test all domestic hot and cold water piping and all gas piping at 150 psig hydrostatic pressure for 8 hours. Insulated or otherwise concealed piping
shall be tested before being closed in. All leaking joints shall be corrected, retested and found tight.

B. The underground piping shall be flushed and tested in accordance with the requirements in NFPA 24. The piping shall be tested and found tight before being backfilled. All leaking joints shall be corrected, retested and found tight.

C. Such tests shall not relieve the Contractor from responsibility for leaks which may develop after the tests.

D. The Contractor shall be responsible for any damage to existing or new work which may result from leaks in the piping work, and for replacement of such work which may have to be removed and replaced to repair any such leaks.

17. FIRESTOPPING

A. All conduits passing through fire-rated masonry walls shall have the spaces between the conduits and the walls sealed with a UL-approved firestopping intumescent foam or sealant complying with the requirements of ASTM E 814. The firestop rating of the foam or sealant shall match the rating of the wall.

18. OPERATING AND MAINTENANCE INSTRUCTIONS

A. Furnish the Owner with on-the-job instructions for the operation and maintenance of all new systems and equipment.

B. At the Punch List Inspection, furnish to the Engineer three loose-leaf-bound copies of instructions, manuals and other applicable published data on the various pieces of equipment. One copy will be retained by the Engineer. The name of the project and of the Owner shall be typewritten on labels on the front cover and on the spine of each book.

19. CUTTING AND PATCHING

A. The General Contractor will be responsible for all cutting and patching necessary to install the plumbing work. Coordinate this work with the General Contractor.

20. CLEAN-UP
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A. Clear away all debris and surplus materials resulting from the performance of this work, and leave the job site broom clean and all new equipment wiped clean.

B. All finished spaces inside the building where work has been carried out shall be vacuumed cleaned.
1. WORK INCLUDED

A. The work includes furnishing and installing all heating, ventilating and air conditioning systems as shown on drawing Sheets HD-1 through H-4 and as specified herein.

B. All wiring over 30 volts will be provided as part of the electrical work.

C. All work shall be provided in accordance with the 2012 edition of the Virginia Uniform Statewide Building Code.

D. All equipment and materials shall be installed in accordance with the manufacturers' recommendations. All equipment and materials shall be new.

E. Perform all HVAC demolition work shown on the drawings or required to install the new work. Remove all demolished equipment and materials from the site.

2. INTENT OF DRAWINGS

A. The drawings are diagrammatic only, intending to show general runs and locations of ductwork, equipment and specialties, and do not necessarily show all required offsets and details. All work shall be accurately laid out with reference to the drawings and in cooperation with other trades to avoid conflicts and to obtain a neat and workable installation which will afford maximum accessibility for operation, maintenance and headroom.

B. The drawings are not intended to be rigid in specific details. Where they are in conflict with requirements of other drawings, with any applicable codes, or with recommendations of the manufacturers of any equipment actually furnished, installed or connected, make such adjustments as may be required to ensure that all such equipment installed and connected is in conformance.
with such codes or recommendations, for the safe, proper and efficient operation of the equipment.

3. SUBMITTALS

A. Manufacturers' engineering data describing materials and equipment to be used in the construction work shall be submitted to the Architect for review by the Engineer. The Engineer's review of the engineering data will cover only general conformity of the data to the requirements of the specifications.

B. Engineering data shall be submitted on the following:

1. Rooftop unit, including all of the control components
2. Motors
3. Terminal boxes
4. Mini-split systems
5. Medium pressure ductwork
6. Duct liner
7. Grilles, registers and diffusers
8. Electric heaters
9. Fire dampers and access doors

C. The reviewing of the submittals shall not relieve the Contractor from complying with the drawings and specifications.

4. DESIGN CONDITIONS

A. The design is based on outdoor design conditions of 92 F d.b. and 78 F w.b. in the summer and 17 F in the winter and on indoor design conditions of 78 F d.b. and 50 - 60% r.h. in the summer and 70 F in the winter.

5. ROOFTOP UNIT

A. The rooftop air conditioning unit shall be furnished complete with all components as specified and scheduled. The unit shall be a packaged direct expansion multiple zone variable air volume draw through type complete with airtight and weathertight insulated and gasketed casing, fans, motors, drain pan, cooling coil, compressors, gas fired heat exchanger, air cooled condenser, filter, airflow measuring station, variable
frequency drives (VFD), power exhaust, demand controller ventilation, and enthalpy based economizer. The rooftop unit shall be provided with sound attenuation including the quiet condensing fans option and vibration isolation curbs. Internal spring isolation shall not be provided.

B. The unit shall have down discharge airflow. The cooling performance shall be rated in accordance with AHRI Standard 920. The unit shall be factory assembled, internally wired, fully charged with R-410A refrigerant, and factory run tested. It shall be UL and ETL listed.

C. The unit casing shall be constructed of zinc-coated, heavy gauge, galvanized steel with a weather-resistant baked enamel finish. It shall have 2" thick double-wall foamed panel construction throughout the indoor section of the unit to provide non-porous, cleanable interior surfaces. All insulation shall be either captured or sealed. The unit’s base pan shall have no penetration within the perimeter of the curb other than the raised downflow supply/return openings. The top cover shall be of one-piece construction.

D. The unit shall be provided with a factory-installed combination outdoor air sensor located in the outdoor air hood to sense both outdoor air temperature and relative humidity for use by the microprocessor controller to make required ventilation, cooling, dehumidification and heating decisions. A factory-installed sensing tube designed to sense the supply air temperature shall be located downstream of the indoor fan section.

E. The supply fan and exhaust fan shall be of the direct-drive type with the factory-installed variable frequency drives. The motors shall be thermally protected. The fans shall be mounted on rubber vibration isolators to reduce noise transmission.

F. The evaporator coil shall be constructed of internally finned copper tubes mechanically bonded to an aluminum plate fin. The coil shall be leak tested at the factory. A stainless steel double-sloped condensate pan shall be provided.
G. The unit shall have a direct-drive, hermetic, digital scroll compressor with a centrifugal type oil pump, thermal overloads and a crankcase heater. The motor shall be suction gas-cooled. The compressor shall be able to modulate from 20% to 100%.

H. The condenser coil shall be internally finned copper tubes mechanically bonded to an aluminum plate fin. The coil shall be leak tested at the factory. The condenser coil shall have a fin design with slight gaps for ease of cleaning. The condenser coil guards shall be removable to accommodate cleaning.

I. The outdoor fans shall be of the direct drive vertical discharge design with low-noise corrosion-resistant glass reinforced polypropylene propellers, with a powder-coated wire discharge guard. The fans shall be statically and dynamically balanced.

J. The heating section shall use indirect gas-fired heating. The heating section shall have a progressive tubular heat exchanger using stainless steel burners and tubes. An induced draft combustion blower shall be used to pull combustion products through the firing tubes. The heater shall use a direct spark ignition system. On an initial call for heat, the combustion blower shall purge the heat exchanger for 20 seconds before ignition. After three unsuccessful ignition attempts, the entire heating system shall be locked out until manually reset.

K. The rooftop unit shall be completely factory wired with all necessary contacts and contactor pressure lugs for power wiring. Micro-processor controls shall be provided for all 24-volt control functions. The resident control algorithms shall make all heating, cooling and ventilating decisions in response to electronic signals from sensors measuring outdoor temperature and humidity as well as indoor temperature. The control algorithms shall maintain accurate temperature control, minimize drift from setpoint, and provide better building comfort. A micro-processor shall provide anti-short cycle timing. A factory-provided static pressure sensor shall be shipped with the unit for installation inside the supply ductwork.
L. Provide aluminum MERV 8 mesh filters and galvanized mesh bird screen in the outside intake. Provide 2" MERV 8 rated filters ahead of the evaporator coil.

M. Provide a UL listed, 3-pole, non-fused molded case disconnect switch with provisions for through-the-base electrical connections. Provide wiring from the disconnect switch to the unit’s high voltage terminal block.

N. Provide a factory-wired voltage/phase monitor which shall shut down the unit when the following conditions are detected: a phase unbalance, and over/under/brownout voltage, or a phase loss/reversal.

O. The sequences of operation shall be as follows:

1. The unit shall be placed in occupied operation when it receives a signal from the Building Automation System (BAS). The outside air damper shall remain closed and the return air damper shall be open during building warm-up and building cool-down. When the space temperature has reached its setpoint, the outside air damper shall open to its minimum position and the return air damper shall modulate to its minimum position.

2. The enthalpy economizer mode shall be enabled when the outdoor air enthalpy remains below the return air enthalpy and continue until the outdoor air enthalpy rises above the return air enthalpy by 3 BTU/lb or when the outdoor air temperature rises above 80 F. If the outside air temperature is more than 2 F below the discharge air setpoint, then the DX cooling shall be locked out and the dampers shall modulate to maintain the discharge air setpoint. If the outdoor air temperature is above that point by a deadband of 1 F, then the outdoor air damper shall open to the maximum damper position and allow DX cooling to operate as necessary.

3. Should the outdoor air temperature fall below the discharge air temperature setpoint (field adjustable), and the heat/cool mode deadband (field adjustable), then the heating mode shall be
enabled. During the heating mode, the main unit controller shall modulate the heating output to maintain the leaving air temperature setpoint.

4. Should the outdoor air temperature rise above the discharge air temperature setpoint (field adjustable), then the cooling mode shall be enabled. Compressor control shall be based on the discharge air temperature setpoint. If the discharge air temperature is above setpoint, the first stage of cooling will start. If after a 3 minute minimum delay, the discharge air temperature is still above the setpoint, the second, third and fourth stages of cooling will be enabled sequentially following individual 3 minute delays between each call.

5. When the supply fan operation has been proven and the unit is in occupied mode, the exhaust fan speed shall modulate to maintain the return duct pressure setpoint. During unoccupied mode, the powered exhaust fan shall be off.

6. Provide a carbon dioxide sensor in the return air duct to the unit to sense the average carbon dioxide level in the spaces. The unit controls shall compare the reading of the sensor to the CO2 setpoint. If the CO2 level in the space is higher than the setpoint, the controls shall modulate the outdoor air damper open until the average CO2 level in the space is less than the setpoint value. The unit control will then modulate the outside air damper toward its minimum position and remain in that position until the average space CO2 level changes again.

7. The unit controls shall utilize the outdoor airflow monitoring sensor and the modulating damper to compare the outdoor airflow sensor value with the outdoor air setpoint. If the outdoor airflow is higher than the setpoint, the unit controls shall modulate the outdoor air damper open until the airflow levels reach the setpoint value or until the damper is at the maximum damper position. The unit controls will continue to
monitor the airflow and adjust the damper position to match the outdoor airflow to the setpoint.

8. During the unoccupied cooling mode, the supply fan shall start and modulate to maintain the duct static pressure setpoint, the exhaust fan and the energy wheel shall remain off, and the outside air damper shall remain closed. The unit shall stage the compressors to maintain the discharge air temperature setpoint. When the return air temperature matches the unoccupied cooling setpoint temperature, the supply fan shall stop.

9. During the unoccupied heating mode, the supply fan shall start and modulate to maintain the duct static pressure setpoint, the exhaust fan shall remain off, and the outside air damper shall remain closed. The unit shall stage the heat to maintain the discharge air temperature setpoint. When the return air temperature matches the unoccupied heating setpoint temperature, the supply fan shall stop.

10. The powered exhaust fan motor shall be of the direct drive type with a factory-installed VFD to allow variable volume operation. The motor shall be thermally protected.

P. Provide factory startup for the rooftop unit. Provide three copies of the startup report to the Engineer prior to the Punch List Inspection, and include the report in the Operation and Maintenance manuals.

Q. The rooftop unit shall have a first-year whole unit parts and labor warranty by the manufacturer and a 5-year parts-only warranty on the compressors and the variable frequency drive. Provide a 25-year warranty on the gas heat exchanger.

R. The rooftop units shall be as manufactured by Carrier, Daikin or Trane. NO SUBSTITUTIONS WILL BE ACCEPTED.

S. Provide a prefabricated curb for the rooftop unit. It shall be of the insulated type, 12-14 inches high, complete with mounting flange, integral cant strip and rack or flange to support dampers. The outer shell
shall be mitered and welded continuously to form a rigid leakproof shell. The inner shell shall be solid metal similarly constructed. Wood nailing strips shall be bolted to the top of the curb shell to provide a means for securing the flashing material to the curb.

T. Provide a PVC trap on the unit’s condensate discharge connection.

U. The motors shall be as specified hereinafter.

V. The rooftop unit shall be as manufactured by Carrier, Daikin or Trane. NO SUBSTITUTIONS WILL BE ACCEPTED.

6. MOTORS AND MOTOR CONTROLLERS

A. All motors shall be furnished by the manufacturer of the equipment served and shall be mounted and aligned so as to run free and true. Each motor shall be constructed to conform to the latest applicable NEMA, ANSI and IEEE standards for the type and duty of service it is to perform.

B. All motors less than ½ Hp shall operate on 120 volt, single phase power, and all motors ½ Hp and larger shall operate on 208 volt or 460 volt, three phase power, as required. All motors 1 Hp and larger shall have grease lubricated ball bearings and approved grease fittings.

C. All motors shall be provided with adequate starting and protective equipment and a terminal box of adequate size to accommodate the required conduit and wiring, shall have Class B insulation and shall have a 1.15 service factor. All three phase motors shall be provided with overload protection in all three phases.

D. Nominal minimum efficiencies for 1750-1800 rpm open dripproof motors shall be not less than the following:

<table>
<thead>
<tr>
<th>Motor size</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 Hp</td>
<td>78.0%</td>
</tr>
<tr>
<td>1-1/2 Hp</td>
<td>84.0%</td>
</tr>
<tr>
<td>2 Hp</td>
<td>84.0%</td>
</tr>
<tr>
<td>3 Hp</td>
<td>89.5%</td>
</tr>
</tbody>
</table>
7. TERMINAL BOXES

B. Provide single duct variable air volume terminal boxes as shown and scheduled on the drawings. The boxes shall be UL listed and certified under ARI Standard 880. They complete with insulated casing, damper and damper seat, of the pressure independent type with electric heating coil. The heating coil shall be at the unit discharge and shall include modulating SCR heating control.

C. The casings shall be constructed from 22 gauge steel. The interior surface of the unit casing shall be acoustically and thermally lined with 1" thick, 2 lb. density fiber-free insulation with foil facing, which shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50. Provide metal flanges on the discharge of the unit. Comply with all applicable requirements for duct liner specified hereinafter.

D. The dampers shall be heavy gauge steel with the shaft rotating in self-lubricating bearings. The shaft shall be clearly marked on the end to indicate damper position. The damper shall incorporate a mechanical stop to prevent overstroking. The actuator shall be capable of supplying adequate torque to the damper shaft and shall be mounted externally for service access.

E. The terminal boxes shall include factory-furnished application specific controls furnished by the BAS manufacturer with integral microelectronic flow sensors mounted in a NEMA 1 enclosure. The controllers shall be connected to a multi-port inlet velocity sensor with center averaging, mounted in the inlet to the terminal. An individual transformer on each terminal box shall provide power for the controller.

F. Each controller shall be wired, calibrated and tested at the factory prior to shipment, with communications
address, sequence and factory-set maximum/minimum flow limits.

G. Bi-directional 24 volt synchronous electric damper actuators shall be provided at the factory. The motors shall have heavy duty gears and contain a magnetic clutch which releases when the damper is driven to either extreme. Stall type actuators and DC actuators without current limiting shall not be acceptable.

H. The controllers shall modulate the damper motors to maintain the airflow from each terminal box, in accordance with the calculated heating and cooling requirements, by comparing the sensed space temperature with the setpoint and time of day schedule. The zone temperature shall be controlled to within \( \pm 1 \) F. The airflow shall be controlled down to 250 fpm and shall be read in 25 fpm increments at velocities greater than 500 fpm.

I. Setpoints, flow limits and occupancy schedules shall be maintained indefinitely in each controller's non-volatile memory. No batteries shall be required. Each controller shall also maintain in its own non-volatile memory a record of space temperature and/or airflow for the preceding 24 hours.

J. Provide an UL-tested and ETL-listed electric resistance reheat coil in each terminal box. Each box shall have a SCR controller to modulate the heater to supply the exact amount of heat required to satisfy the zone requirement. The SCR shall modulate the time that the electric heater is powered on, and not the KW of the heater. The heater shall give the full kW output for a pulsed duration of time.

K. Provide a factory-mounted disconnect switch and a power line fuse for each box.

L. The variable volume terminal boxes shall be as manufactured by Carrier, Daikin or Trane. NO SUBSTITUTIONS WILL BE ACCEPTED.

8. MINI-SPLIT UNITS
A. Provide a ductless mini-split cooling-only system for the IT Room, as scheduled on the drawings. The unit shall be certified by AHRI Standard 210-240. The indoor and outdoor units shall be a matched pair provided by the same manufacturer. The units shall be listed by Electrical Laboratories (ETL).

1. The outdoor unit casing shall be constructed of heavy gauge galvanized steel painted with a weather-resistant paint. The casing shall include a hot-dip galvanized steel grille to protect the condenser and internal components. The unit shall be equipped with integral circuit boards which shall perform all functions necessary for operation. The outdoor unit shall have an inverter compressor and provided with refrigeration system controls. The unit shall be completely factory assembled, internally piped and wired, and fully charged. The contractor shall match the piping sizes to the outdoor piping connections. The electronic expansion valve shall be located in the outdoor unit and shall modulate to vary the refrigerant and provide safe and reliable system operation. The outdoor unit shall be capable of operation at outdoor temperatures from 0 F to 110 F. The outdoor condenser shall have a multi-speed fan motor. The outdoor unit condenser coils shall consist of aluminum-finned coils brazed to copper tubing. The unit shall have a 3-minute time safety to prevent rapid cycling of the compressor. Provide 12 AWG wire to provide power to the indoor unit from the outdoor unit, and provide 14 AWG to provide a control interface between the indoor and outdoor units.

2. The outdoor unit shall be factory run tested before shipment. The refrigerant lines from the outdoor unit to the indoor unit shall be provided and tested as recommended by the unit manufacturer, and they shall be field insulated as recommended by the unit manufacturer.

3. The indoor unit shall be high wall-mounted and completely assembled, including coil, condensate drain pan, fan motor, and washable filter. The unit shall be furnished with a mounting plate.
The unit shall have specially designed air vents which shall efficiently reduce operation noise. The air vents shall be horizontal motorized blades with preset selectable settings to optimize air distribution. The blades shall close automatically when the unit is in standby mode or powered off. The unit shall be provided with a two-piece removable and washable permanent polymeric filter, which shall be accessible without removing the unit front cover. The unit shall have a multi-speed fan capable of low, medium, high and turbo speeds. The turbo speed shall be utilized when the unit is first enabled to quickly reach the desired setpoint. The unit shall display temperature and mode, including cool, dry, fan only, and auto. When in the dry mode, the unit shall call for cooling while limiting the fan to the low speed setting. The unit shall be capable of a “sleep” function, which will run an automatic factory-set night setback function that will raise the setpoint 2 F every 2 hours for a maximum setback of 4 F. The unit shall be capable of a “timer” function that will allow the unit to automatically turn on or off after a specific time delay.

4. Provide a wall-mounted wired remote controller with backlit LED display, capable of setting On/Off control, unit mode and temperature setpoint. The controller shall be capable of setting a setpoint between 61 F and 86 F and shall have the following modes: heat, cool, dry, fan only, and auto.

B. Provide a ductless mini-split heating and cooling system for the Teachers’ Lounge, as scheduled on the drawings. The unit shall be certified by AHRI Standard 210-240. The indoor and outdoor units shall be a matched pair provided by the same manufacturer. The units shall be listed by Electrical Laboratories (ETL).

1. The outdoor unit shall be equipped with multiple circuit boards which shall perform all functions necessary for operation. The outdoor unit shall be completely factory assembled, internally piped and wired. It shall be factory run tested before
shipment. The refrigerant lines from the outdoor unit to the indoor unit shall be provided and tested as recommended by the unit manufacturer, and they shall be field insulated as recommended by the unit manufacturer.

2. The outdoor unit shall have an accumulator, a high-pressure safety switch, a fuse, over-current protection and a crankcase heater. The outdoor unit shall be capable of operating in the cooling mode between 115 F and 23 F and in the heating mode between 75 F and -4F ambient temperatures. The outdoor unit shall have a high-efficiency oil separator plus additional logic controls to ensure that adequate oil volume is maintained in the compressor. The unit shall have a horizontal snow blower feature to ensure the dispersion of accumulated snow. The unit casing shall be fabricated of galvanized steel, bonderized and finished with a powder-coated baked enamel. The outdoor condenser fan shall be furnished with a direct drive, variable speed motor. The motor shall have inherent motor protection and have permanently lubricated bearings. The outdoor unit shall have horizontal discharge airflow. The outdoor condenser coil shall be of nonferrous finned construction on copper tubing and be provided with an integral metal guard. The unit shall be provided with a modulating rotary compressor which shall utilize inverter driven technology to modulate capacity. The unit shall have a crankcase heater. The compressor shall be equipped with integral thermal overload protection. The compressor shall be mounted so as to avoid the vibration transmission.

3. The indoor unit shall be a four-way cassette style that recesses into the ceiling. It shall be factory-assembled, wired and run tested. The unit shall contain all wiring, a piping control circuit board, and the fan motor. It shall have a self-diagnostic function, a 3-minute time delay mechanism, and an auto restart function. The unit shall be provided with a face-mounted infrared receiver for use with a handheld wireless remote controller. The unit shall have an integral
return air sensor. The indoor fan shall consist of a turbo fan with a single direct drive motor. The fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings. The fan shall have low, medium and high speeds. The fan speed shall be adjustable by an optional remote controller. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution. The return air shall be filtered by means of a washable permanent filter. The indoor coil shall be of nonferrous construction with fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. A condensate pan and drain shall be provided under the coil.

a. Disable in the field the damper closest to the wall. Coordinate this work with the manufacturer.

4. Provide a wall-mounted wired temperature controller which shall utilize a multi-function LCD display, capable of power on/off setting, temperature setpoint control, room temperature, mode selection (auto/cool/dry/fan/heat), fan speed setting, and a dirty filter alert.

5. Provide a wall cap for the outside air intake. The wall cap shall be constructed from aluminum and furnished with a backdraft damper, bird screen and a dark bronze finish.

C. Provide all required field wiring between the indoor units and the outdoor units.

D. Provide a condensate lift pump for each ductless mini-split indoor unit. Pipe the pump discharge using Sch. 40 PVC pipe to the outdoors, where directed by the Architect. The pump shall have a remote reservoir with float and filter, ant-siphon device, and inline fuse.

E. Provide a pad as recommended by the unit manufacturer under each outdoor unit to protect the roof.
F. Provide factory startup for each ductless mini-split system.

G. The existing Trane Tracer Building Automation System serving the building will monitor both of the indoor and outdoor units and the space temperatures in the rooms they serve.

9. SHEET METAL WORK

A. Provide all sheet metal work shown on the drawings, specified herein and as required to provide a complete system. The installation of the sheet metal work shall comply with NFPA 90A and NFPA 90B. The construction and installation of all sheet metal work shall comply with the standards, details and recommendations of the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), as covered in the latest edition of SMACNA's "HVAC Duct Construction Standards," SMACNA's "HVAC Air Duct Leakage Test Manual" and SMACNA's "HVAC Systems - Testing, Adjusting and Balancing." Where the word "should" appears in the above manuals, it shall be read "shall" for the purposes of this paragraph.

B. All ductwork shall be installed to true alignment and parallel or perpendicular to walls, floors and ceilings, so as to present a neat and workmanlike appearance. The ductwork in the Fitness Center shall be exposed. Elsewhere, all ductwork shall be concealed above the ceilings and inside chases. Ductwork installed indoors shall be not less than G60; ductwork installed outdoors shall be G90.

C. Properly size and locate all necessary openings in the building construction required for the installation of the sheet metal work. Provide steel lintels to support masonry walls above the new ducts.

D. The drawings are to be followed where they are definite and provided such procedure causes no objectionable conditions or does not conflict with laws, codes, regulations or recommendations of equipment manufacturers. The drawings are intended to show approximate locations and sizes of ductwork, etc.; if certain sizes are omitted or unclear, obtain additional information.
from the Engineer before proceeding. The dimensions shown on the drawings for the exposed ducts are for reference purposes to aid in the layout and routing.

E. All joints, seams, screws and rivets in all ductwork shall be sealed airtight with a coat of sealing compound applied all over and around each potential point of leakage so as to assure air tightness. There shall be no leakage detectable to the hand or the ear. Special care shall be taken on sealing the exposed ductwork in finished areas so as not to detract from its appearance when painted. Sealing of the exposed ductwork in finished areas which is sloppy, badly applied or sagging shall not be accepted.

F. All lined duct sections and joints shall be closely inspected before and after each piece is erected. Loose edges, open joints, damaged areas and other defects shall be sealed securely.

G. Provide volume dampers as required for properly regulating and balancing the air flow. The dampers shall be controlled by a galvanized locking quadrant indicating the damper position.

H. Low velocity rectangular ductwork shall be constructed from galvanized steel sheets of lock-forming quality. All square elbows in rectangular ductwork shall have double thickness turning vanes. The supply and return air ducts shall be lined as specified hereinafter. Exposed low velocity ductwork in finished areas shall have a paint grip finish.

I. Medium pressure rectangular ductwork shall consist of an external pressure-tight galvanized steel shell, 1" insulation between the external and internal walls, and a perforated internal metal liner next to the airflow. The ductwork shall be constructed for pressures above 2" and shall meet the leakage requirements of SMACNA’s Leakage Class 3 in SMACNA’s HVAC Systems Duct Design. Support ductwork in an approved manner as dictated by SMACNA. Special attention shall be given to the support of exposed rectangular ductwork in finished areas so as not to detract from the finished duct layout. Supports on exposed rectangular ductwork shall be provided with a primer coat of paint. The exposed
ductwork in finished areas shall be constructed of galvanized sheet metal with a paint grip finish. The ductwork shall be shop constructed or prefabricated equal to McGill Airflow sheet metal Rectangular-k27 duct and fittings. The ductwork connection system shall be equal to McGill Transverse Duct Connector (TDC) system. Exposed duct fittings which are field installed and require cutting through duct shell, liner and perforated inner shell, such as tap-ins and saddle taps will not be allowed. All taps, takeoffs, transitions and changes in direction on exposed duct shall be made with fabricated fittings. The ductwork shall be supported from the First Floor slab using \( \frac{5}{8} \)" all-threaded rod. Use \( \frac{5}{8} \)" Hilti Kwik Bolts II, or approved equal, to attach the rods to the floor slab with an embedment into the concrete of at least 3-1/4".

J. Medium pressure flat oval and round ductwork shall be factory fabricated and shall consist of an external pressure-tight galvanized steel shell, 2" thick insulation between the external and internal walls for ducts installed indoors and 3" thick insulation for ducts installed outdoors, and a perforated internal metal liner next to the airflow. All fittings shall be of the conical type with slip connections. The ductwork shall be constructed for pressures above 2" and shall meet the leakage requirements of SMACNA’s Leakage Class 3 in SMACNA’s HVAC Systems Duct Design. Provide loose iron angle rings with a primer coat of paint for support of the ductwork. The exposed ductwork in finished areas and outdoors shall have a paint grip finish. The ductwork shall be equal to McGill Airflow sheet metal acousti-k27 Type P duct with UNI-SEAL fittings and AccuFlange connectors. Exposed duct fittings which are field installed and require cutting through duct shell, liner and perforated inner shell, such as tap-ins and saddle taps will not be allowed. All taps, takeoffs, transitions and changes in direction on exposed duct shall be made with fabricated fittings. The ductwork shall be supported from the First Floor slab using \( \frac{5}{8} \)" all-threaded rod. Use \( \frac{5}{8} \)" Hilti Kwik Bolts II, or approved equal, to attach the rods to the floor slab with an embedment into the concrete of at least 3-1/4".
K. All exposed ductwork shall be inspected for sharp metal edges or protruding corners. After such inspection, all surfaces or corners which may cause personal injury shall be corrected so as not to cause injury. All exposed support angles shall have their sharp edges ground down, and all exposed threaded rods shall terminate no lower than ½" below the support nuts. Cover the ends of all exposed threaded rods with acorn nuts.

L. All duct dimensions shown on the drawings are air flow sizes. The thickness of the duct liner must be added to them to obtain sheet metal sizes.

M. Provide 3" long flexible connectors at the inlets and outlets of all supply, return, relief and exhaust fans.

N. The ductwork shall be cleaned of all foreign matter before the equipment is started.

10. DUCT LINER

A. All low velocity supply and return ducts shall be lined with 1-1/2" thick fiberglass duct liner with a factory-applied acrylic surface and edge coating. The duct liner shall meet the requirements for life safety as established by NFPA 90A and 90B, should not support microbial growth as tested in accordance with ASTM G 21 and G 22, shall conform to the requirements of ASTM C 1071, shall be installed in accordance with the North American Insulation Manufacturers Association's (NAIMA) "Fibrous Glass Duct Liner Standard," and shall have a thermal conductivity no higher than 0.25 at 75 F mean temperature. Outside air, relief air and exhaust ducts shall be unlined.

B. The liner shall be installed with the surface treatment exposed to the airstream. All interior surfaces of all ductwork and fittings shall be completely covered with duct liner, without interruptions or gaps, except where required by Code (such as in areas of fire dampers or electric heaters).

C. Adhesive shall be applied to the sheetmetal with a minimum coverage of 90%. All transverse edges not receiving sheetmetal nosing shall be coated.
Longitudinal joints in the duct liner shall occur at the corners of ducts. However, duct size and standard duct liner dimensions may make exposed longitudinal joints necessary. In such cases, the exposed joints shall be coated with an adhesive or coating designed for duct liner application, and the duct liner shall be additionally secured with mechanical fasteners in accordance with the NAIMA Standard as if it were a transverse joint. The adhesive shall meet the requirements of ASTM C 916.

D. All joints shall be firmly butted without gaps. All rips and tears on the airstream surface shall be repaired by coating the damaged areas with an adhesive or coating approved by the liner manufacturer, or the liner shall be replaced. Longitudinal corner joints may be folded and/or overlapped and compressed.

E. Mechanical fasteners shall be used to secure the duct liner to the sheetmetal and shall be spaced in accordance with the NAIMA Standard. These may be either impact-driven or weld-secured. The mechanical fasteners shall be installed perpendicular to the duct surface and shall not compress the liner more than 1/8" based on the nominal liner thickness.

F. Metal nosings (either channel or zee profile) shall be securely installed over transverse liner edges facing the airstream at the fan discharge and at any interval of lined duct preceded by unlined duct. In addition, where velocities exceed 4,000 fpm, metal nosings shall be installed on upstream edges of lined duct sections.

G. All lined duct sections and joints shall be closely inspected before and after each piece is erected. Loose edges, open joints, damaged areas and other defects shall be sealed securely.

11. GRILLES, REGISTERS AND DIFFUSERS

A. Provide all grilles, registers and diffusers as shown and scheduled on the drawings. The units shall be rated in accordance with Air Diffusion Council (ADC) standards and shall be selected for a maximum noise level in the spaces of NC 35. All supply outlets shall be adequately sealed for leakage. Baffles shall be
provided to direct air away from walls, columns or other obstructions within the radius of diffuser operation. Return grilles and registers shall be set so as to minimize the view through the blades. The grilles, registers and diffusers shall have an off-white finish.

12. ELECTRICAL WORK

A. All electrical apparatus that is furnished shall be approved by the Underwriters' Laboratories (UL) and shall be so labeled or listed where applicable.

B. All low voltage wiring required to control electrical apparatus and equipment furnished as part of the HVAC work will be done as part of the HVAC work. All line voltage wiring will be done as part of the electrical work.

C. Except for electrical apparatus, devices, controls, etc., specifically called for as a part of the HVAC work, all motor controllers and disconnect switches required for such electrical apparatus shall be part of the electrical work.

D. All electrical apparatus, devices, controls, etc., furnished as a part of the HVAC work shall conform to the applicable requirements for such equipment as specified in the electrical work.

13. ELECTRIC HEATERS

A. The electric heater in the Lobby shall be UL Listed, pedestal-mounted, totally-enclosed, vandal-resistant security electric heaters with wattages as noted on the drawings. Provide all components required for a complete installation. The front cover shall be constructed from 12 gauge extruded aluminum with 1/4" pencil proof intake and discharge grilles; it shall linear mount to the 12-gauge heater back with no visible fasteners. The heater shall have an anodized finish. The heater shall be furnished with an automatic reset linear capillary type thermal cutout, a single pole integral thermostat set at 70°F (adjustable), and a disconnect switch. The heater shall have a power density of 200 watts per linear foot and shall operate on 120 volt, 1 phase power.
B. The electric heater in the Electrical Room shall be UL listed and as shown and scheduled on the drawings. It shall have a heavy gauge welded steel cabinet and a control compartment housing a master terminal board with a hinged and latched access door. The heating element shall be a copper clad steel sheath with continuously brazed steel fins formed to allow side draw through air flow. The unit shall be equipped with automatic reset type limit controls to de-energize the heater should an over-temperature situation occur. The fan motor shall be totally enclosed, 1-speed, permanently lubricated and thermally protected, mounted on rubber vibration isolators. The fan shall purge the heat after shutdown.

1. The louvers shall be individually adjustable for directional control of the airflow.

2. Provide all accessories noted in the schedule.

3. Mount the unit heater securely to the wall as recommended by the manufacturer.

14. TESTING, ADJUSTING AND BALANCING

A. The test, adjusting and balancing work shall be conducted in accordance with the requirements of the AABC’s National Standards for Total System Balance, Seventh Edition, by a certified balancing company customarily in the testing and balancing business. Four copies of the complete balancing report shall be delivered to the Engineer at the Punch List Inspection. The balancing report shall state that the work was done in accordance with the AABC’s standards and shall include a Check List summary similar to Figure 6.3 in the manual and a completed instrument list utilizing a form comparable to AABC’s Instrument List.

1. Either coordinate the startup reports for the various pieces of equipment with the startup personnel for each piece of equipment, and/or obtain all of the required information directly, so that complete test and balance reports will be provided to the Owner.
B. The Contractor shall provide a written statement to accompany the balancing reports stating that the reports are both complete and correct in his opinion and that they conform to AABC procedures. The balancing reports will be returned to the Contractor unreviewed unless such a written statement accompanies the reports.

C. The test and balance reports shall state that the work was done in accordance with AABC procedures.

D. Test and balance Rooftop Unit No. 1 and existing Rooftop Unit 12 to obtain the required air quantities. After the units have been tested and balanced, record the measured air quantities.

E. Test and balance the terminal boxes to obtain the required air quantities. After the unit has been tested and balanced, record the measured air quantities.

F. Balance the grilles, registers and diffusers serving RTU 1 and existing RTU 12 to obtain the required air flows. After the grilles, registers and diffusers have been balanced, record the measured air flows.

G. Test the two mini-split systems to obtain the required air flows. After the units have been tested, record the test measurements.

15. FIRE DAMPERS AND ACCESS DOORS

A. Fire dampers shall be UL classified with 1-1/2 hour ratings and replaceable 165 F fusible links. Fire dampers other than in ducts serving shower rooms shall have one-piece 22 gauge galvanized steel frames and blades. Fire dampers in ducts serving shower rooms shall have one-piece 22 gauge Type 304 stainless steel frames and blades. The blades shall be located outside of the airstream. Fire dampers located in floors and walls shall be equal to Ruskin Model IBD2, Style B Curtain Type Static Fire Dampers, except as required hereafter. Fire dampers located in walls behind diffusers shall be equal to Ruskin Model IBDT Thinline Static Fire Dampers.
B. Where required, access for the replacement of fusible links and resetting fire dampers shall be through duct access doors not less than 12” x 12”, wherever such size is possible, with double cam locks. They shall be located in the ducts so that the links are accessible.

C. Access doors in finished surfaces shall be suitable for flush installation in gypsum wallboard walls or masonry walls, as required. The frames shall be 16 gauge steel, the panels shall be 20 gauge steel, and the concealed spring hinges shall allow opening to 175 degrees. The lock assemblies shall be key operated with case-hardened steel cams. The locks shall have identical keys. Provide two keys to the Owner and obtain a receipt.

D. Access doors in fire-rated finished surfaces shall be suitable for flush installation in walls of all types. The frames shall be 14 gauge steel, the panels shall be 20 gauge steel, and the steel continuous concealed spring hinges with stainless steel pins shall allow opening to 175 degrees. The lock assemblies shall be key operated with case-hardened steel cams. The locks shall have identical keys. Provide two keys to the Owner and obtain a receipt.

16. OPERATING AND MAINTENANCE INSTRUCTIONS

A. Furnish the Owner with on-the-job instructions for the operation and maintenance of all new systems and equipment.

B. At the Substantial Completion/Punch List Inspection, furnish to the Architect three loose-leaf-bound copies of instructions, manuals and other applicable published data on the various pieces of equipment. One copy will be retained by the Engineer. The name of the project and of the Owner shall be typewritten on labels on the front cover and on the spine of each book.

17. CUTTING AND PATCHING

A. The General Contractor will be responsible for all cutting and patching necessary to install the HVAC work. Coordinate the cutting and patching work with the General Contractor.
15. CLEAN-UP

A. Clear away all debris and surplus materials resulting from the performance of this work, and leave the job site broom clean and all new equipment wiped clean. The interior surfaces of all equipment shall be vacuum cleaned prior to balancing and filter installation.

B. All finished spaces inside the building where work has been carried out shall be vacuumed cleaned.
1. WORK INCLUDED

A. The work includes furnishing all supervision, labor, materials and equipment necessary for and reasonably incidental to the installation of the electrical work as shown on drawing Sheets E0.1 through E6.1 and as specified herein.

B. All work shall be in accordance with the 2012 edition of the Virginia Uniform Statewide Building Code.

C. All equipment and materials shall be installed in accordance with the manufacturers' recommendations. All equipment and materials shall be new, except where noted otherwise on the drawings.

D. The work includes making proper connection to all equipment requiring electrical power.

E. Perform all electrical demolition work shown on the drawings, or required to install the new work. Remove all demolished equipment and materials from the site.

F. The electrical work shall be performed in accordance with the National Electrical Contractors Association’s (NECA) NECA 1-2000, “Standard Practices for Good Workmanship in Electrical Contracting.”

G. Coordinate the replacement of the existing electrical service to the building with the new service with the Dominion Energy and the Owner. Provide the Owner with not less than 14 days of notice before a proposed shutdown of the existing service, include an estimated length of time for the electrical power outage, and obtain the Owner’s written approval of the interruption before proceeding.

2. INTENT OF DRAWINGS

A. The drawings are diagrammatic only, intending to show general runs and locations of conduit, wiring and equipment, and do not necessarily show all required offsets and details. All work shall be accurately laid out with reference to the drawings and in cooperation with other trades to avoid conflicts and to obtain a neat and workable installation which will afford maximum accessibility for operation, maintenance and headroom.
B. The drawings are not intended to be rigid in specific details. Where they are in conflict with requirements of other drawings, or with any applicable codes or with recommendations of the manufacturers of any equipment furnished, installed or connected, make such adjustments as may be required to ensure that all such equipment installed and connected is in conformance with such codes or recommendations, for the safe, proper and efficient operation of the equipment.

3. CODES AND REGULATIONS

A. All materials and workmanship shall be in accordance with the 2011 edition of the National Electrical Code (NEC) and all applicable local rules, regulations, laws and ordinances.

B. All fire alarm work shall comply with the provisions of NFPA 72, National Fire Alarm Code.

4. UNDERWRITERS’ LABEL AND LISTING

A. All materials, devices and equipment used in performance of the work specified herein shall be approved by Underwriters' Laboratories (UL) and shall be so labeled or listed where such label or listing is applicable.

5. SUBMITTALS

A. Manufacturers' engineering data describing materials and equipment to be used in the construction work shall be submitted to the Architect for review by the Engineer. The Engineer's review of the engineering data will cover only general conformity of the data to the requirements of the specifications.

B. Engineering data shall be submitted on the following:

1. Wiring devices
2. Disconnect switches
3. Switchboard
4. Panelboards
5. Transient voltage surge suppressor
6. Light fixtures
7. Invertor
8. Dimming control systems and occupancy sensors
9. Extension of the existing fire alarm system
10. Firestopping
C. The reviewing of the submittals shall not relieve the Contractor from complying with the drawings and specifications.

6. ELECTRICAL SERVICE

A. All work relating to the electrical service shall be done in accordance with the requirements of Dominion Energy.

B. Instrument transformers and meter base will be furnished by Dominion Energy for installation by the Electrical Subcontractor. The meter will be furnished and installed by Dominion Energy. All work relating to the installation of this equipment shall be coordinated with Dominion Energy.

C. The CT Cabinet shall be constructed in accordance with the requirements of Dominion Energy for a customer-owned connection box.

D. Dominion Energy will install service entrance cable in the new service entrance conduits from its distribution system to the new CT cabinet.

7. CONDUIT

A. All concealed interior conduit shall be EMT where practical and metal clad cable (MC) elsewhere, all exposed interior conduit in unfinished spaces shall be EMT. No conduit shall be less than 3/4” trade size. All conduit shall be exposed in unfinished spaces. All conduit shall be installed perpendicular or parallel to ceilings, walls and floors. Conduits shall be run at least 6” from uninsulated heating pipes.

B. All exposed conduit installed outdoors shall be rigid galvanized steel with watertight sealed couplings.

C. Short sections of flexible waterproof conduit with an interwoven grounding wire shall be used for connections to all motor-driven equipment.

8. WIRE AND CABLE

A. All conductors shall be copper insulated for 600 volts and shall not be smaller than No. 12 AWG unless otherwise noted. Conductors shall be continuous from outlet to outlet with splices made only in outlet and junction boxes. Splices in No. 6 AWG and smaller wire shall be made with screw type connectors.

B. All conductors installed inside the building shall be Type THHN or Type THWN. All conductors No. 8 and larger shall be multiple stranded. All
conductors installed outside the building shall be Type THWN.

C. All cables and conductors shall be installed using equipment designed for cable and conductor pulling and by personnel experienced in such work. Every precaution shall be taken to ensure a minimum of bending and abrasion of the cable and conductor jackets or injury to the conduit.

9. PULL BOXES, JUNCTION BOXES AND OUTLET BOXES

A. Pull boxes shall be installed at all necessary points, whether indicated on the drawings or not, to prevent injury to the insulation or other damage that might result from pulling resistance or other reason during installation. All pull boxes shall be constructed from galvanized steel and shall be of code gauge. All pull boxes shall be located in accessible locations. Pull boxes shall be labeled with the panel and circuit number feeding the device.

B. All outlet and junction boxes shall be of one piece construction and of a type and size applicable for use in the locations shown on the drawings and as required by the NEC. Boxes for exposed work shall be of the "Condulet" type as manufactured by Crouse-Hinds Company. Install galvanized steel plates on all junction boxes.

C. All boxes shall be securely and rigidly attached to the permanent building construction and shall not depend upon conduit for support. Provide knockout closers for all unused openings.

D. Locate boxes in masonry walls to require cutting only corners of the masonry units. Coordinate the cutting of masonry units to achieve neat openings for the boxes. Boxes shall be installed in exterior walls without damaging the wall insulation.

E. Position boxes for lighting fixtures so as to provide a symmetrical layout for the fixtures.

F. Floor-mounted boxes shall be UL listed, of steel construction with aluminum duplex cover plates with flip lids, set flush with the finished floor.

10. WIRING DEVICES

A. All wiring devices shall be commercial specification grade.

B. Interior duplex convenience receptacles shall be rated for 20 amps at 125 volts. The colors of the receptacles shall be as determined by the Archi-
tect. The neutral blade shall be on top.

C. Duplex receptacles incorporating ground fault protection where shown on the drawings or where required by the NEC shall be rated for 20 amps at 125 volts. The colors for interior receptacles shall be as determined by the Architect.

D. Local switches for single pole and three-way control of lighting circuits shall be rated for 20 amps at 120 volts. The switch colors shall be as determined by the Architect.

E. Device plates shall be of the correct type and number of gangs for each device or group of devices and shall be from the same manufacturer as the devices. Plates in finished areas shall be thermoplastic in a color to be determined by the Architect. Device plates in unfinished areas shall be made of pressed steel.

F. All wiring devices shown on walls in finished areas shall be flush mounted. Wiring devices may be surface mounted only in unfinished areas. In general, wall switches shall be mounted 48" above the floor to the center of the device, and receptacles shall be mounted 18" above the floor. Wall switches shall be mounted so that the "off" position is down. Receptacles mounted vertically shall be installed with the grounding pole on top; receptacles mounted horizontally shall be installed with the ground blade on top.

11. GROUNDING

A. Provide all grounds required by the NEC.

12. DISCONNECT SWITCHES

A. Provide all fused and non-fused safety disconnect switches shown on the drawings or required by the NEC. The switches shall be of the proper size and of the required number of poles. Disconnect switches shall be mounted within sight of the motors being served and shall be securely and rigidly attached to the permanent building construction and shall not depend upon conduit for support.

B. All 30 amp interior disconnect switches shall be general duty with NEMA 1 enclosures. All interior disconnect switches over 30 amps in size shall be heavy duty with NEMA 1 enclosures. All exterior disconnect switches shall be heavy duty with NEMA 3R enclosures.
C. Provide nameplates for the disconnect switches. The nameplates shall be of laminated black and white Bakelite, machine engraved through the black outer layer to expose the white inner layer, using letters not less than 3/16" high. The nameplates shall be mechanically attached to the switches.

D. Disconnect switches shall be labeled with the panel and circuit number feeding the device.

13. SUPPORTING DEVICES

A. Provide all supporting devices required for the electrical work. All horizontal and vertical runs of raceways shall be properly grouped and hung to true alignment. The conduit shall be installed at proper intervals as required by the NEC. Conduit shall not be supported from insulated ducts or pipes.

14. FEEDERS AND BRANCH CIRCUITS

A. Provide all feeders and branch circuits where shown on the drawings. All feeders and branch circuits shall be of the sizes and type shown on the drawings or as required for the equipment actually furnished. The locations of the feeders and branch circuits are approximate only; changes in location necessitated by field conditions shall be made at no additional cost to the Owner.

15. MOTORS AND MOTOR STARTERS

A. All motors will be furnished by the manufacturer supplying the equipment requiring the motors. All motors shall conform to the latest applicable NEMA, ANSI and IEEE standards for type, size and duty, as specifically applied.

B. Motor starters shall be labeled with the panel and circuit number feeding the device.

16. SWITCHBOARD

A. Provide a UL Listed, 2,500 amp, 120/208 volt switchboard in a NEMA PB2.1 General Purpose enclosure, as scheduled on the drawings. The switchboard shall be UL labeled for use as service entrance equipment and comply with the requirements of ANSI 61 and PB 2.1. It shall include two distribution sections and be wired for 208/120 volt, 3 phase, 4 wire service.
B. The switchboard shall be totally enclosed, dead front, free standing, rear aligned with front access. The framework shall be of UL gauge steel and secured together to support all cover plates, bussing and component devices during shipment and installation. Removable closure plates shall be used on the front, rear and sides. Each section shall include a single-piece removable top plate. All painted parts shall be pretreated and provided with a corrosion-resistant acrylic baked paint finish. Each section shall be of bolted construction with lifting lugs.

C. The service entrance section compartment shall comply with UL Service Entrance requirements including a service entrance label, incoming line isolation barriers, and a removable neutral bond to switchboard ground for solidly grounded wye systems, and with Dominion Energy requirements. The compartment shall be barriered from the rest of the section, have a hinged lockable front cover, and have removable bus links with provisions for mounting current transformers and voltage transformers. The current and voltage transformers will be provided by Virginia Dominion Power. Provide mechanical lugs in the service entrance section; they shall be tin-plated aluminum and UL listed for use with copper cable.

D. The entire switchboard, including all circuit protective devices, shall have a short circuit rating of 100,000 RMS symmetrical amperes.

E. The switchboard shall be furnished with copper busses with electroplated joints and terminations. All bus connections shall be bolted with high tensile strength steel bolts and spring loaded washers. The switchboard shall be furnished with a neutral bonding jumper, 100% neutral bus with a disconnect link, a copper ground bus, grounding electrode and ground fault protection. The through bus and ground bus shall be 100% rated and sized to meet the requirements of UL 891. Blank fillers shall be installed on all unused mounting spaces. Provide full height wiring gutter doors for quick access to wiring terminals. Type A-B-C bussing (left-to-right, top-to-bottom, front-to-rear) shall be used throughout the switchboard to assure convenient and safe testing and maintenance.

F. Provide group-mounted fusible switches. Those rated 60 amps or less shall be equipped with UL class R fuse clips and fuses. Fusible switches rated above 600 amps shall be equipped with UL class L fuse clips and fuses. Provide a complete set of fuses for each switch. The external handle shall be padlockable in the off position. The handle shall be interlocked with the switch cover to prevent access to the switch interior when the switch is On. The interlock shall have an override release. The switches shall include factory-installed mechanical lugs. The lugs shall be UL listed. The switches shall be standard, or 80 percent rated.
G. Verify the concrete pad for uniformity and level surface before installing the switchboard.

H. After the switchboard has been set in place, tighten all accessible bus connections and mechanical fasteners. Check the tightness of all accessible bus joints with a calibrated torque wrench and compare with the manufacturer’s recommended values. Measure the insulation resistance of each bus section, phase to phase and phase to ground, for one minute each and compare with the manufacturer's recommended values.

I. Provide a nameplate for each distribution switch.

17. PANELBOARDS

A. Panelboards shall be as scheduled on the drawings. The circuit breakers in the panelboards shall be of the bolt-on type with hinged door in door construction. The submittals shall include a circuit breaker schedule for each panelboard. The panelboards shall be constructed to UL standards, 120/208 volt, 3 phase, 4 wire, and shall be furnished with cabinet and front, solid neutral and ground bus. The panelboards shall be of standard depth with the gutters increased if necessary to accommodate feeder and tap connections. Provide a typewritten directory card of circuits served by each panelboard.

B. During and after installation of the circuit breakers, inspect the equipment and wires for physical damage, proper alignment, anchorage and grounding. Check for proper installation and tightness of the connections to the circuit breakers.

C. Prior to energizing the circuit breakers, test the devices for continuity of the circuitry and for short circuits. Correct any devices or wiring found to be malfunctioning.

D. Provide nameplates for the panelboards. The nameplates shall be made of laminated black and white Bakelite, machine engraved through the black outer layer to expose the white inner layer, using letters not less than 3/16” high. The nameplates shall be mechanically attached to the panelboards.

E. Circuit breakers installed in existing panelboards shall have the same interrupting capacity as the existing circuit breakers in those panelboards.

F. Where existing panelboard circuits are revised, update the typewritten
directory cards to show the new circuits and/or equipment served by the panelboards. The information shall be typed on new cards or neatly printed on the existing cards in permanent black ink. Circuits which are no longer used shall be labeled as "SPARE."

18. TRANSIENT VOLTAGE SURGE SUPPRESSOR

A. Provide a transient voltage suppressor (TVSS) for the switchboard. The TVSS shall carry an unconditional 5-year warranty.

B. The TVSS and its associated hardware shall be UL listed under UL 1449 as a branch panel and service entrance panel protective device and shall be configured for parallel installation. The TVSS, including its subassemblies and components, shall be 100% tested and certified by the manufacturer to meet the required performance parameters. The TVSS shall be of a fail-safe design, shall have no holdover current, and shall be self-restoring and fully automatic. It shall have replaceable modules in case the unit clamps down to failure. The TVSS shall have a UL 1449 clamping level of 400 volts. The TVSS shall be furnished with an integral disconnect.

C. The TVSS shall protect all of the circuit breakers in its switchboard from the hazardous effects of transient overvoltages, regardless of whether these overvoltages are generated externally by lightning induced energies, utility load factor corrections and substation switching, or internally by inductive or capacitive load switching.

D. The TVSS shall incorporate large block MOVs for the purpose of performance and reliability. Protection shall be provided for all modes: phase, neutral and ground. The Maximum Continuous Operating Voltage (MCOV) shall be 150 Vrms for a 120 volt nominal voltage rating. The let-through voltage performance in each mode, per UL 1449, shall not exceed the following:

<table>
<thead>
<tr>
<th>Service Voltage Mode</th>
<th>Suppression Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 Line-to-neutral</td>
<td>900</td>
</tr>
<tr>
<td>120 Neutral-to-ground</td>
<td>900</td>
</tr>
<tr>
<td>120 Line-to-ground</td>
<td>900</td>
</tr>
<tr>
<td>120 Line-to-line</td>
<td>900</td>
</tr>
</tbody>
</table>

E. The TVSS shall have a maximum surge suppression rating of 300,000 amps, which shall apply to every component in the unit and shall have neutral-to-ground protection. No fuse or overcurrent device shall either fail or
operate during the factory test of the TVSS.

F. The TVSS shall contain both thermal safety fusing and short circuit fusing within each protection circuit. The fusing mechanisms employed shall effectively coordinate their performance in conjunction with the full surge handling capabilities of the suppressor.

G. The TVSS shall provide visual mechanical indicators to show the status of its operational readiness. It shall have a contact for connection to the BAS to indicate failure of the TVSS.

19. LIGHT FIXTURES

A. Furnish, assemble, hang and connect all light fixtures as shown and scheduled on the drawings. Where doing so poses a conflict, the conflict shall be brought to the Architect’s attention. All fixtures shall be furnished complete with sockets, internal wiring, leads, trim, hangers, supports, frames, lamps, etc., as applicable and required for a complete and workmanlike installation. The light fixtures shall be located as shown on the architectural drawings.

B. Just prior to the project being turned over to the Owner, relamp lighting fixtures which have failed lamps, align all fixtures, and clean dirt and debris from all fixtures.

20. INVERTOR

A. Provide a lighting inverter for emergency lighting backup, as shown and scheduled on the drawings. It shall be rated for up to 525 watts and produce a high quality, utility grade sine wave. It shall have a fused input breaker, a sealed lead-calcium battery, a runtime of 90 minutes, a 24-hour recharge time, a very high overload and fast transfer time, an interactive LCD display, programmable settings, an automatic and a manual test feature, and self-diagnostics that retain critical data logs.

21. DIMMING CONTROL SYSTEMS AND OCCUPANCY SENSORS

A. Provide a UL listed room dimming system for the Reading Room, as scheduled on the drawings. This shall be a distributed system comprised of standalone and networked control devices. The control devices shall include but not be limited to lighting control panels, room controllers, wall switch stations, occupancy/vacancy sensors, user interfaces, network interfaces, and related input/output devices. Provide a related conduit, wire, boxes and mounting hardware required to provide a complete and
The lighting control system hardware shall be designed, tested, manufactured and warranted by a single manufacturer. The components shall be UL listed under UL 916, Energy Management Equipment.

2. The room controller shall control the required quantity or lighting and plug loads. The room controller shall provide 0 - 10 volt dimming output for the required number of dimmable lighting loads. The room controller shall integrate the functionality of the connected control components, including wall switch stations, occupancy sensors and daylight sensors to provide the required sequence of operation for the space. The room controller and associated room control components shall operate in a totally standalone mode and not require the use of a network, software, computer or server for local control functions.

3. Four RJ45 smart port connectors shall be accessible on the side of the enclosure for connection of room control devices. Two recessed pushbuttons and associated LED indicators shall be accessible on the top of the enclosure to provide override, status, setup and testing functions.

4. The room controller shall have one or two output relays to provide a total combined power switching capacity of 20 amps per unit. The controller shall have one or two independent 0 - 10 volt dimming outputs for full range dimming control of fixtures equipped with compatible dimmer ballasts or drivers. Each dimming output shall have a current sinking capacity of at least 30 mA. The controller shall be capable of supplying 150 mA of Class 2 auxiliary DC power for use by wall switch stations, occupancy sensors, and daylight sensors connected to the room controller’s four RJ45 smart port connections. The controller shall be equipped with power monitoring circuitry capable of measuring and reporting the total connected load.

5. Provide an integral pushbutton and LED indicator for each load for status and to allow operation of the relays and dimmers for testing and verification without requiring other control devices to be connected. The controller shall have a default operation providing an automatic logical sequence of operation for each load as
the room control devices are plugged into the smart port connectors. The default operation for the occupancy sensors shall be automatic on, automatic off. Upon connection of a switch, the operation shall automatically change to manual On, automatic Off (vacancy) mode for all loads. When in vacancy mode, provide a 30-second grace period after an Off during which automatic On shall be temporarily enabled. Provide the capability to convert each load independently to automatic on, or vacancy mode using only the integral pushbuttons and LED indicators on the controller. It shall be possible to connect up to 8 room controllers together using Cat 5 patch cables to provide configurations up to 16 switched and dimmed loads operating as a single zone.

6. Provide the following setup and configuration functions without the need for additional devices or software:

a. Assign/reassign relays for control by wall switch station buttons.
b. Configure relays for occupancy or vacancy operation.
c. Assign/reassign dimmers to raise/lower switches.
d. Assign dimming channels for response to daylight sensor control.
e. Auto calibrate default daylight sensor sequence of operation.
f. Save preset scenes

7. The network bridge module shall allow multiple room controller zones to be networked with other station devices for whole building administration of lighting control function. The bridge shall connect to and be powered from a room controller smart port via a standard Cat 5 cable. Two additional RJ-45 ports on the bridge shall provide an in and out connection point for an Ethernet-based system. The network bridge module shall provide a communication link between the room control devices and the system Area Controller via an Ethernet-based network. At a minimum, the network link shall provide the following functionality through a web browser user interface:

a. Report the current occupancy status for each lighting control zone.
b. Indicate the status of each relay and dimming channel.
c. Allow reconfiguration of system device input and output parameters.
d. Report the real time power consumption for each room.
controller.
e. Set up daylight harvesting for zones equipped with photocells.
f. Configure and download schedules to panels and room controllers.

8. Low voltage digital wall switch stations shall be of the programmable type using standard Cat 5 cabling for connection to the system smart port. The stations shall have one to six buttons and provide the required lighting control functions. All switches shall be single gang and be of the generic decorator style allowing easy ganging and use of a wide array of standard wall switch plate options. Provide two RJ-45 ports per switch to allow for daisy chain connection of up to 8 switches to each smart port. The switch station color shall be as selected by the Architect.

9. The occupancy sensors shall be ceiling- or wall-mounted as required and use dual technology (ultrasonic and passive infrared), as required. The sensors shall be Class 2 and connect to any room controller smart port using a wiring adaptor and standard Cat 5 patch cable. The occupancy sensors shall be self adaptive and not require manual calibration after installation. Digital circuitry and logic shall automatically make adjustments to the sensitivity and time delay based on learned occupancy patterns and the environment in which the sensor is installed. Sensors using both ultrasonic and passive infrared (dual technology) shall operate such that detection by both technologies is required to initiate occupancy, and continued detection by either technology shall maintain occupancy. Up to four occupancy sensors may be connected to one room controller.

10. The daylight sensors shall provide ambient light level information to the room controller allowing daylight responsive lighting control. The system shall operate in an open loop sequence of operation reducing the amount of electric light as the quantity of daylight entering the room increases. It shall be possible to configure up to six daylight zones in a room. Each zone shall be programmable to proportionally respond to the light level provided by the daylight sensor. The daylight sensor shall be mounted and positioned to provide an unobstructed view of the windows per the manufacturer’s directions.

11. The area controller shall be a web-browser-based system of programming, monitoring and administration. The area controller
shall have the ability to communicate by means of TCP/IP over Ethernet allowing enterprise connectivity between the distributed lighting control system and external LAN or WAN networks. Provide an integral capability to communicate with the building automation system via BACnet IP protocol.

12. The area controller shall operate on 120 volt power.

13. The area controller shall function as a web server allowing the user interface to be accessible through a standard web browser. The installation of software shall not be required. At a minimum, the user interface shall provide the following functions:

   a. Automatic discover of system devices.
   b. Commissioning of devices into logical areas and zones providing a minimum of 128 areas each with 96 zones.
   c. Display the entire system in a logical navigation tree view.
   d. Allow the user to name zones, groups, presets, schedules and individual loads.
   e. Set up control functions for system inputs and outputs.
   f. Monitor status and override individual relays and dimmers.
   g. Set up and download schedules to panels and room controllers.
   h. Monitor real-time power use at each room controller.

14. The contractor shall verify all wire type and routing requirements with the lighting controls manufacturer prior to installation.

15. Provide all raceways, electrical boxes, junction boxes, circuit protection, wiring and fittings required for the installation of the lighting control equipment.

16. Provide a factory-certified field service technician to ensure proper system installation and operation. Provide up to 4 hours of on-site training on the use and maintenance of the lighting control system to be scheduled at the completion of startup and programming of the system.

B. Provide individual room occupancy sensor/dimmer wall switches as shown and scheduled on the drawings. The occupancy sensor/dimmer wall switches shall be compatible with the dimming drivers and ballasts. The wall sensors shall be of the Passive Infrared (PIR) type with 0-10 volts dimming control. The default operation is for Manual On, so that users turn lights on only when needed. They shall use PIR technology to detect
occupancy. Once the space is vacated and the time delay has elapsed, the lights shall automatically turn Off. Dip switches settings shall enable a variety of control options such as Auto-On operation, high and low trim, ramp up and fade down times, power loss mode, smart light level, walk-through and test modes. The color of the wall plates shall be as selected by the Architect.

1. The wall switches shall be equal to Watt Stopper Model PW-311.

22. EXTENSION OF THE EXISTING FIRE ALARM SYSTEM

A. Extend the existing Siemens MXL-iQ addressable fire alarm system to the new and renovated rooms. All components required for a complete installation shall be provided. All wiring shall be installed in conduit, all conduit and junction boxes shall be concealed, and all devices shall be flush mounted. Where it is impractical to conceal the conduit or boxes, the Owner and Architect may approve using surface-mounted conduit and boxes on a case-by-case basis.

B. All items of the fire alarm system shall be listed as a product of the fire alarm system manufacturer under the appropriate UL category and shall bear the UL label.

C. The submittals shall be approved by the Authority Having Jurisdiction before being submitted to the Architect.

D. The design of the extension of the existing fire alarm system is a delegated design. The manufacturer of the existing fire alarm system shall comply with the following performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation:

1. Comply with the recommendations in the documentation section of the Fundamentals of Fire Alarm Systems chapter in NFPA 72.

2. Include voltage drop calculations for notification appliance circuits.

3. Include battery-size calculations.

4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature and humidity possible when the air handling system is operating.
5. Include floor plans to indicate final outlet locations showing the address of each device, and show the size and route of cables and conduits.

6. The fire alarm system operating matrix.

E. Provide addressable devices as required, including the smoke detectors in the return air ducts to the rooftop units.

F. All junction boxes shall be painted red and labeled "Fire Alarm". The wiring color code shall be maintained throughout the installation.

G. Clean all dirt and debris from the inside and the outside of the fire alarm system equipment after completion of the installation.

H. The manufacturer’s authorized representative shall provide on-site supervision of the installation of the fire alarm system.

I. The completed extension of the fire alarm system shall be fully tested in accordance with NFPA 72 by the manufacturer’s authorized representative and the contractor in the presence of the Owner and the local Fire Marshal. Upon completion of a successful test, either the manufacturer’s authorized representative or the contractor shall so certify in writing to the Owner, The Architect, the Engineer and the General Contractor.

J. Furnish the Owner with on-the-job instructions for the operation and maintenance of the complete fire alarm system.

23. SLEEVES

A. Where conduits pass through masonry or concrete walls or floors, the wall or floor openings shall be fitted with Schedule 40 steel sleeves the full thickness of the walls or floors and grouted in place. Sleeves shall be of a diameter that will admit passage of the pipe.

24. EMPTY CONDUIT SYSTEMS

A. Provide empty conduit systems for the Owner’s telecommunications and data systems, as called for on the drawings, including all conduit, pull boxes, pull wires and accessories required for complete systems. Provide a plastic bushing on each end of each empty conduit.

25. FIRESTOPPING
A. All conduits passing through fire-rated masonry walls shall have the spaces between the conduits and the walls sealed with a UL-approved firestopping intumescent foam or sealant complying with the requirements of ASTM E 814. The firestop rating of the foam or sealant shall match the rating of the wall.

25. OPERATING AND MAINTENANCE INSTRUCTIONS

A. Furnish the Owner with on-the-job instructions in the operation and maintenance of all electrical equipment.

B. At the Punch List Inspection, furnish to the Architect three loose-leaf-bound copies of instructions, manuals and other applicable published data on the various pieces of equipment. One copy will be retained by the Engineer; the other two will be delivered to the Owner. The name of the project and of the Owner shall be typewritten on labels on the front cover and on the spine of each book.

27. CUTTING AND PATCHING

A. The General Contractor will be responsible for all cutting and patching necessary to install the electrical work. Coordinate this work with the General Contractor.

28. CLEANUP

A. Clear away all debris and surplus materials resulting from the performance of this work, and leave the job site broom clean and all new equipment wiped clean.

B. All finished spaces inside the building where work has been carried out shall be vacuumed cleaned.
1. WORK INCLUDED

A. The work includes providing all supervision, labor, materials and equipment necessary for and reasonably incidental to an extension of the existing Trane Tracer building automation system (BAS) as shown on Sheet H1, and as specified herein. The BAS work shall include but not be limited to the following:

1. Providing a complete system of Direct Digital Controls (DDC) consisting of controllers and other miscellaneous items to perform the specified Sequences of Operation.

2. Integrating the work of this Division with the existing Trane Tracer Operator Workstation at Buildings and Grounds.

3. Providing all necessary graphical programming language (GPL) programming to accomplish the specified Sequences of Operation consistent with the existing Facilities Management Systems Control practices, including the creation and generation of system graphic displays as described herein.

4. Providing all miscellaneous control work, detectors, panels, devices, components, materials and appurtenances, including installation and wiring, to complete the BAS.

B. All work shall be provided in accordance with the 2012 edition of the Virginia Uniform Statewide Building Code.

C. All equipment and materials shall be installed in accordance with the manufacturers' recommendations. All equipment and materials shall be new.

D. Provide all line voltage power wiring required to install the BAS.

E. Coordinate the BAS with the HVAC and electrical work so that the final installation will be in the best interest of the Owner.

F. The electrical work shall be performed in accordance with the National Electrical Contractors Association’s (NECA) NECA 1-2000, “Standard Practices for Good Workmanship in Electrical Contracting.”
2. SUBMITTALS

A. Manufacturers' engineering data describing materials and equipment to be used in the construction work shall be submitted to the Architect for review by the Engineer in sufficient quantities for the Engineer to retain three copies. The Engineer's review of the engineering data will cover only general conformity of the data to the requirements of the specifications.

B. The submittals shall include the following:

1. Direct Digital Control system drawings and wiring diagrams, including detailed descriptions of operation. The control drawings shall clearly show each electrical conductor and their connections between DDC controllers, sensors, transmitters, transducers, valve actuators and all other devices providing analog input (AI) and/or digital input (DI) signals or receiving analog output (AO) or digital output (DO) signals. The terminal and/or point identification of each controller and each peripheral device shall be clearly shown next to each terminal point. Single line diagramming in lieu of multiple conductors to or from any controller or peripheral device shall not be acceptable.

2. Product data sheets for all system components and appurtenances, including all field hardware.

C. The reviewing of the submittals shall not relieve the Contractor from complying with the drawings and specifications.

3. GENERAL SYSTEM REQUIREMENTS

A. The BAS shall be an extension of the existing Trane Tracer building automation system. NO OTHER MANUFACTURER WILL BE PERMITTED.

B. The BAS control components shall be based upon BACnet ASHRAE Standard 135 Conformance Level 4 or LonTalk communications protocol (EIA 709.1) and LonMark functional profile configurations.

C. The extension of the BAS shall be Direct Digital Control (DDC) systems which shall be modular in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, standalone DDC panels and operator devices.

D. All electrical components 25 volts and above shall be UL listed or labeled.
E. Provide a Magnehelic differential pressure gauge across the filters in the rooftop unit. The gauge shall be of the diaphragm-actuated dial type and shall have an accuracy of \(\pm 2\%\) of full scale, \(1/8\)" NPT high and low pressure taps, die cast aluminum housings, vent valves, and ranges of 0 - 1" w.c. Mount the gauge on the side of the unit. The gauge shall be equal to Dwyer Model No. 2001.

F. The smoke detector in the return air connection to the rooftop unit will be provided by the Fire Alarm System Subcontractor. The smoke detector shall be hard wired to shut down the unit it serves when it detects particles of combustion.

4. ELECTRONIC FIELD HARDWARE

A. Temperature sensors may be either Resistance Temperature Devices (RTD) or thermistor elements. Sensor/transmitter assemblies shall be of the type and accuracy as required for the application:

1. Outside air temperature and humidity sensors are existing.

2. Room temperature sensors shall have an accuracy of \(+/-1\) F in the range of 45 F to 95 F. Room temperature sensors with temperature adjustment/override capability shall have a timed local override switch which shall allow the occupant to extend the zone occupancy schedule by a predetermined amount of time. When the zone is scheduled to be unoccupied, toggling the switch shall cause the zone to be placed in the occupied mode. Room temperature sensors with a local setpoint adjustment switch shall give the occupant limited ability to modify the zone's setpoint by a predetermined amount (up to \(+/-3\) F). It shall be possible to enable and disable the override features from the Operator Workstation. Room temperature sensors with communications ports shall allow a portable service tool to communicate directly with the BAS controller. The room temperature sensors shall not display temperature.

3. Air temperature sensors located in supply and return ducts and in fan discharges shall be of the insertion type and shall protrude at least 8' into the airstream being sensed. They shall have an accuracy of \(+/-0.5\) F over the range of application.

4. Air temperature sensors located downstream of coils and in mixed air chambers shall be of the averaging type serpentined evenly over the area of the coil or chamber. The element shall be no less than 1.25' in length for each square foot area of the coil or cham-
B. Humidity sensors shall be of the cellulose acetate butyrate or polymer type with a sensing element and transmitter that provides a 4 - 20 ma or 0 - 10 VDC signal over a range of 20 - 80% relative humidity for indoor applications and 20 - 95% for outdoor applications. They shall have +/- 3% accuracy, including hysteresis, and a drift not exceeding 1% of full scale per year.

1. The sensors shall be capable of either duct mounting with an extended probe or wall mounting for space sensing with matching locking covers.

C. Current sensing relays shall be UL listed and shall monitor the status of motor loads. Each relay shall be of the split-core type, and have an LED to indicate that the relay has been energized. Microprocessor-based current status switches which automatically compensate for the effects of frequency and amperage changes associated with variable frequency drives shall have a self-adjusting trip setpoint to detect belt loss and be used for monitoring motors controlled by variable frequency drives, equal to Veris Model H904. Normally open solid state current status switches with a manual trip setpoint adjustment to detect belt loss shall be used for monitoring constant speed motors, equal to Veris H908.

D. General purpose relays shall be UL listed and have contacts rated in excess of the load controlled and coil ratings at the voltage required for the application. Relays shall be plug-in type, hermetically sealed dust tight, with indicator lights. All relays shall be interchangeable with each other. Relays not mounted in panels shall be enclosed in NEMA I enclosures. Stop/start relays shall provide either momentary or maintained switching action as required.

E. The carbon dioxide sensor will be supplied with Rooftop Unit No. 1.

F. Local control panels shall have fully enclosed NEMA 1 enclosures with key latches on metal enclosures and removable sub-panels. A single key shall be common to all field panels and sub-panels. Interconnections between internal and face-mounted devices shall be prewired with color-coded stranded conductors and secured neatly with tie-wraps. Internal wiring between devices shall be installed in wiring troughs. Terminals for field connections shall be UL listed for 600 volt service, individually identi-
fied in accordance with the control or interlock drawings, with adequate clearance for the field wiring. Control terminations for field connection shall be individually identified in accordance with the control drawings. Each local control panel shall have an ON/OFF switch with overcurrent protection and a duplex convenience outlet.

5. SOFTWARE
   A. Provide all software necessary for a complete and operable system.
   B. Provide 7-day rolling trends of all analog points.

6. SEQUENCES OF OPERATION
   A. Rooftop Unit No. 1 and the two mini-split systems will normally operate under their own controls to provide heating and cooling.
   B. The BAS shall send an occupied-unoccupied signal to Rooftop Unit No. 1 to initiate warm up and cool down prior to occupied periods in the space and to turn the unit off during unoccupied periods.
   C. A space temperature sensor shall be provided to provide night setback control for RTU 1.
   D. A differential pressure switch installed across the filter bank in RTU 1 shall sense the pressure drop across the filters. If the differential pressure exceeds the setpoint of the switch, the BAS shall log an alarm at the Operator Workstation.
   E. Upon sensing the products of combustion, the smoke detector in the return air duct shall stop the supply fan. An alarm shall be logged at the Operator Workstation.
   F. The BAS shall monitor and record the setpoint and actual space and/or return air dry bulb and wet bulb temperatures (or relative humidity) and the carbon dioxide level, and the setpoint and actual supply air dry bulb and wet bulb temperatures (or relative humidity), for RTU 1.
   G. The BAS shall monitor the space temperature of the rooms served by the two mini-split systems.

7. COLOR GRAPHIC SYSTEM DISPLAYS
   A. Create and fully generate color graphic displays for:
8. INSTALLATION

A. The BAS system shall be installed in a neat and workmanlike manner by experienced and trained mechanics either in the direct employ of the system manufacturer, or under the manufacturer's direct supervision.

B. The installed system shall be delivered to the Owner complete in all respects and fully operational.

9. ELECTRICAL WORK

A. All electrical work shall be installed in conformance with applicable provisions of the NEC and of Division 16. The electrical work shall also be performed in accordance with the National Electrical Contractors Association’s (NECA) NECA 1-2000, “Standard Practices for Good Workmanship in Electrical Contracting.” All equipment shall be installed in readily accessible locations as defined in Article 100, Part A, in the NEC.

B. All electrical power wiring, including 120 volt circuits to the DDC panels and all interlock wiring, shall be provided as part of the BAS.

C. Class 2 wiring shall not be installed in conduit with Class 1 wiring. Boxes and panels containing high voltage wiring may not be used for low voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).

D. All wiring, including cables for control circuits, shall be installed in EMT raceway in concealed locations and in unfinished spaces, and in surface-mounted raceway when run exposed in finished spaces where concealed wiring is not practical.

E. All raceways shall be run parallel or perpendicular to the building structure, ceiling and floor, and shall be properly secured and supported.

F. Where Class 2 wiring is run exposed, the wiring shall be run parallel or perpendicular to the building structure, ceiling and floor and shall be properly secured and supported.

G. All conductors and cables shall be sized and insulated for the appropriate service, and in complete accordance with the manufacturer's recommendations and the requirements of the NEC. All AI and AO signals shall be transmitted over shielded twisted pair conductors. All shield drain
wires shall be connected to grounding terminal(s) within the control panel. Where AI and AO signal conductors and cables are required to be run in conduit, the conduit shall be used only for the signal conductors and cables and shall house no other control, line voltage or high voltage conductors.

H. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 2’ of termination with a cable identifier and other descriptive information.

I. Permanently label each point on the field terminal strips to identify the instrument or item served.

J. Provide nameplates for all field panels and other control components where such identification will assist the Owner in troubleshooting the system in the future. The nameplates shall be of machine engraved laminated black and white Bakelite, mechanically attached to the panels and other control components.

10. SYSTEM COMMISSIONING AND START-UP

A. System commissioning shall be accomplished as follows:
   1. Inspect each individual control panel, component, field device, and the connecting wiring and terminations for proper installation, correct placement, and conformance to the BAS shop drawings.
   2. Label each field device with the point ID, date and time of verification, and the commissioning technician’s initials.

B. Operational performance verification shall be accomplished as follows:
   1. Conduct an operational test of each system, including all of the associated control panels, components, and field devices, to verify the proper sequence of operation and the actual performance of the installed system. This verification shall have been successfully accomplished prior to the Punch List Inspection.
   2. Provide written documentation of the system commissioning and performance verification processes described above, including an itemized inspection and validation report with dates and results, and a performance test report for each system with the dates and results of the test of each item in the Sequences of Operation.
C. The BAS inspection and validation process for each system shall be complete prior to attempting start-up, and each system shall have undergone start-up prior to the BAS performance verification process taking place.

D. Submit three copies of the following to the Architect prior to the Punch List Inspection:

1. The commissioning documentation, including the inspection and validation report.

2. All programming required for this installation, together with all manuals required for the Engineer to understand the programming.

11. PROJECT COMPLETION

A. Prior to the Punch List Inspection, the BAS Contractor shall provide the Architect with three sets of the following for his approval:

1. Marked-up "As-Built" electric control diagrams showing the interface between all panels, controls and equipment. The drawings shall identify the panels and equipment connections by word description, terminal numbers and wiring colors and numbers.

2. Floor plan drawings and system graphic displays showing the locations of all sensors, control panels, miscellaneous devices and wiring between all inputs, outputs, local panels and the BAS panels. The wiring and terminal strip schedules shall show color coding and wire numbers for the entire BAS.

3. The Operating and Maintenance manuals in vinyl 3-ring binders, with all written materials typed or neatly handwritten. One copy will be retained by the Engineer, and the other two will be delivered to the Owner.

B. Final review and tests of the completed system shall be performed in the presence of the Architect and Owner during the Substantial Completion/Punch List Inspection. The final test shall show conclusively that the BAS performs its intended and specified function and that all work complies with the intent of the specifications. The BAS Contractor shall demonstrate the proper operation of the BAS network integration, including system access and color graphic system displays from the existing Operator Workstation. All material, equipment and instruments required for the tests shall be furnished by the Contractor at his own expense.
C. Any deficiencies or defects found during the Substantial Completion/Punch List Inspection will be documented by the Architect in writing. The Contractor shall correct all such deficiencies and defects and notify the Engineer when he is ready for observation of the corrected items. Should any deficiencies or defects exist after the Final Inspection, which require additional observations by the Architect, the cost of such additional site visits shall be borne by the Contractor.

D. The Contractor shall provide instruction to the Owner’s personnel in the proper operation of the new BAS equipment and software when requested by the Owner.

12. MAINTENANCE AND SERVICE

A. The BAS Contractor shall furnish on-going maintenance during the first year of operation following Substantial Completion at no additional cost to the Owner.

13. FIRESTOPPING

A. All conduits passing through fire-rated masonry walls shall have the spaces between the conduits and the walls sealed with a UL-approved firestopping intumescent foam or sealant complying with the requirements of ASTM E 814. The firestop rating of the foam or sealant shall match the rating of the wall.

14. CUTTING AND PATCHING

A. The General Contractor will be responsible for all cutting and patching necessary to install the BAS work. Coordinate this work with the General Contractor.

15. CLEANUP

A. Clear away all debris and surplus materials resulting from the performance of this work, and leave the job site broom clean and all new equipment wiped clean.

B. All finished spaces inside the building where work has been carried out shall be vacuumed cleaned.
SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY
   A. This Section includes the following:
      1. Protection of existing trees.
      2. Clearing and grubbing.
      3. Removal of trees and other vegetation.
      4. Topsoil stripping.

1.3 DEFINITIONS
   A. Remove: Remove and legally dispose of items indicated. Removal includes digging out and off-site disposing of stumps and roots or burning if allowed by local ordinance.
   B. Tree Protection Zone: The area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.
   C. Topsoil: Friable, clay loam surface soil, found in varying depths.

1.4 MATERIALS OWNERSHIP
   A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS
   A. Photographs or videotape, sufficiently detailed, of existing conditions of trees, plantings and other improvements adjoining the construction that might be misconstrued as damage caused by the Work.

1.6 PROJECT CONDITIONS
   A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close
or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
1. Protect existing improvements on adjoining properties and on Owner's property.
2. Restore existing improvements damaged by clearing operations to their original condition.

C. The conditions existing at the time of inspection for bidding purposes will be maintained by the Owner to the extent practical. However, minor variations may occur due to natural occurrences prior to the start of clearing work.

D. Do not commence site-clearing operations until erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 TREE PROTECTION FENCING

A. Tree protection fencing shall conform to standard and specification 3.38-2 (plastic fence) of the Virginia Erosion and Sediment Control Handbook.

PART 3 – EXECUTION

3.1 PROTECTION OF EXISTING TREES AND VEGETATION

A. Install tree protection fencing as indicated. Erect and maintain a temporary fence around the drip line of individual trees or around the perimeter drip line of groups of trees to remain.
1. Do not store construction materials, debris, topsoil or other excavated material within the tree protection zone.
2. Do not permit vehicles or other equipment within the tree protection zone.
3. Maintain tree protection zones free of weeds and trash.

B. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line.

C. Provide protection for roots over 1-1/2 inch diameter that are cut during construction operations. Coat cut faces with emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
D. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Architect.

3.2 SITE CLEARING

A. General: Remove trees, shrubs, grass and other vegetation as required to permit installation of the Work. Cut minor roots and branches of trees indicated to remain in a clean and careful manner, where such roots and branches obstruct installation of the Work.

B. Clearing and Grubbing: Clear site of trees, shrubs and other vegetation within the clearing limits indicated.
   1. Completely remove stumps, roots, and other debris.
   2. Use only hand methods for grubbing inside drip line of trees indicated to remain.
   3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact to a density equal to adjacent original ground.

C. Selective Clearing: Clear areas designated as "Selective Clearing" of all ground covers, underbrush and trees less than 6-inches in diameter at breast height. Coordinate extent of material removed with Architect.
   1. Remove trees that appear to be dying or weakening for any reason and at any point during construction up to and including Substantial Completion at the Architect’s direction.

3.3 TOPSOIL STRIPPING

A. Remove heavy growths of grass from areas before stripping.

B. Strip topsoil to whatever depths are encountered, but to a minimum of at least 4 inches.

C. Strip topsoil in a manner to prevent intermingling with underlying subsoil or other material.
   1. Remove subsoil and non-soil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

D. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.

E. Temporarily stockpile topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, if required, to prevent wind erosion.
   1. Do not stockpile topsoil within tree protection zones.

F. Dispose of unsuitable or excess topsoil in a legal manner off-site.
3.4 DISPOSAL OF WASTE MATERIALS

A. Burning on Owner's Property: Burning may be allowed on this site subject to approval from the local Fire Marshall and other authorities having jurisdiction. Comply with all conditions of the burn permit, if it is obtained.

B. Removal from Owner's Property: Remove waste materials generated by clearing operations from Owner's property and dispose of in a legal manner off-site.
   1. Remove waste materials and debris from the site in a manner to prevent spillage. Pavements and the area adjacent to the site shall remain free from mud, dirt and debris at all times.
   2. Clean up debris resulting from site clearing operations continuously with the progress of the work.

END OF SECTION 311000
PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. The provisions of the Contract Documents apply to the work of this Section.
   B. Refer to Section 01 2110 and the Bid Form for information concerning required
      allowances and unit prices.
   C. Refer to Section 31 1000 for topsoil stripping and Section 32 9200 for topsoil
      placement.

1.2 SUMMARY
   A. This Section includes the following:
      1. Excavation, filling, backfilling, and grading indicated and necessary for proper
         completion of the work.
      2. Preparing of subgrade for building slabs, walks, and pavements.
      3. Drainage/porous fill course for support of building slabs.
      4. Excavating and backfilling of trenches.
      5. Excavating and backfilling for underground mechanical and electrical utilities
         and buried mechanical and electrical appurtenances.

1.3 SUBMITTALS
   A. VDOT approved Job Mix for stone.
   B. Imported fill (if required): Submit location of borrow pit and a sample of the soil for
      approval to the Owner’s Geotechnical Engineer a minimum of fourteen (14)
      working days prior to use
   C. Geotextile Fabric
   D. Copy of Blasting Permit, approved by authorities having jurisdiction, for record
      purposes.

1.4 DEFINITIONS
   A. Excavation: Removal of all material (except for rock) encountered to design
      subgrade elevations indicated for cut areas and to subsoil elevations in fill areas.
      Excavation also includes subsequent respreading, moisture conditioning,
      compaction, and grading of satisfactory materials removed.
B. Unauthorized Excavation: Removal of materials beyond the limits indicated in the definition of “Excavation” without specific direction of Architect.

C. Additional Excavation: Removal, disposal and replacement of materials beyond the limits indicated in the definition of “Excavation” at the direction of the Architect. Refer to Part 3 of this Section for requirements of Additional Excavation.

D. Subgrade: The undisturbed earth (in cut) or the compacted soil layer (in fill) immediately below granular subbase, drainage fill, or topsoil materials.

E. Subsoil: The undisturbed earth immediately below the existing topsoil layer.

F. Building Pad: The area extending 10 feet beyond the exterior limits of the building/column footings and down to undisturbed soils at a one horizontal to one vertical slope.

G. Structures: The area extending a minimum of ten (10) feet beyond the edge of foundations, slabs, curbs, underground tanks, piping or other man-made stationary features occurring above or below ground surface.

H. Pavements: The area extending 10 feet beyond the exterior limits of paved areas and down to undisturbed soils at a one horizontal to one vertical slope. The area extending 3 feet beyond the exterior limits of walks and down to undisturbed soils at a one horizontal to one vertical slope.

I. Subbase Material: Artificially graded mixture of crushed gravel or crushed stone meeting VDOT specifications. Material type is indicated on the drawings.

J. Drainage/Porous Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel meeting the requirements of VDOT No. 57 Stone.

K. Rock: Hard bed rock, boulders or similar material requiring the use of rock drills and/or explosives for removal. The criteria for classification of general excavation as rock is any material which cannot be dislodged by a Caterpillar D-8 Tractor, or equivalent, equipped with a single tooth hydraulically operated power ripper. The criteria for trench rock shall be that a Caterpillar 345 Backhoe, or equivalent, with a proper width bucket cannot remove the material.

1.5 ADDITIONAL WORK

A. Paragraph 4.3.4 of General Conditions refers to certain conditions that may require additional excavation work. This paragraph is further defined herein and, where there are conflicts, is superseded by this section.

B. Claims for concealed, unknown, or unanticipated subsurface conditions are limited to those circumstances where:

1. Additional excavation work is required below the contract limits indicated to provide acceptable bearing for building pad, structures or pavements.

2. Additional excavation work is required to raise, lower, or revise the footings, foundations or other parts of the building to provide acceptable bearing.
3. Additional excavation work below the utility trench design elevations, for utilities outside the limits of the building, as required to provide acceptable bearing for the utility.

4. Rock is encountered between existing grade and design subgrade.

C. The risks of concealed, unknown, or unanticipated subsurface conditions (except for rock) from existing ground surface to the design subgrade elevations in cut areas and to subsoil elevations in fill areas shall be included in the Contract Amount and shall not be considered as grounds for additional costs to the Contract. The risks of concealed, unknown, or unanticipated subsurface conditions below the elevations stated above shall be considered as Additional Excavation.

D. During construction, if concealed, unknown, or unanticipated subsurface conditions are encountered which require that footings, foundations or other parts of the building be raised, lowered or revised to provide acceptable bearing for the building or if, outside the building limits, additional depth of utility trench excavation below the design subgrade or subsoil elevations is required, immediately notify the Architect upon discovery of such condition prior to disturbing the material encountered.

E. Payment for additional Work

1. Additional excavation shall be counted toward the unit price allowances established in the Bid Form. The Owner reserves the right to negotiate said unit price allowances prior to the Award of Contract.

2. Lowering of footings shall be paid for at a negotiated amount. The additional excavation involved shall be counted toward the unit price allowance.

3. Rock removal, if required, shall be counted toward the unit price allowances established in the Bid Form. All rock removal required to complete work other than trenching shall be paid for at the unit price for mass rock removal. Rock payment lines are limited to the following:

   a) Two feet outside of concrete work for which forms are required, except footings.

   b) One foot outside perimeter of footings, two feet below bottom of footings.

   c) In pipe trenches, 6 inches below invert elevation of pipe and 2 feet wider than outside diameter of pipe, but not less than 3 feet minimum trench width.

   d) Outside dimensions of concrete work where no forms are required.

   e) Under slabs on grade, 6 inches below bottom of concrete slab.

4. No payment will be made for unauthorized excavation.

5. The expense of surveying quantities of rock removal and additional excavation shall be included in the unit price allowances.
1.6 EARTHWORK BALANCE ADJUSTMENTS
A. It is anticipated that some material will be required to be imported to achieve the finish grades indicated on the Drawings. Importation of the required material shall be a Contract responsibility. **No additional payment will be made for the importation of this material.**

1.7 QUALITY ASSURANCE
A. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

B. Environmental Compliance:
   2. Comply with the permit conditions for all work performed within wetlands.

C. Testing and Inspection Service: Owner will employ and pay for an independent Geotechnical testing and inspection laboratory to perform soil testing and inspection service during earthwork operations. Cooperate with Owner’s Geotechnical Engineer as required for testing and inspection of work. These services do not relieve the responsibility for compliance with Contract Document requirements.

1.8 PROJECT CONDITIONS
A. Site Information: Data concerning subsurface materials or conditions, which are based on test borings, have been obtained by the Owner for his use in designing the project. This data is contained in a report titled “GEOTECHNICAL ENGINEERING STUDY, Media Center and Student Drop-Off Loop, North Elementary School, Colonial Heights, Virginia” by Atlantic Geotechnical Services, dated March 20, 2017. This report is included in this project manual for information only.
   1. The accuracy or completeness of the data is not warranted or guaranteed by the Owner or the Architect/Engineer, and in no event shall be considered part of the Contract Documents. The Owner and Architect/Engineer expressly disclaim any responsibility for the data as being representative of the conditions and materials that may be encountered.

B. Bidders and interested parties (prior to receipt of bids) are encouraged to conduct their own soil and subsurface investigations, examinations, tests, and exploratory borings to determine the nature of the soil conditions underlying the project site. Contact the Owner's office to make an appointment to enter the site for the purpose of conducting your own investigation prior to bid.

C. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner of others except when permitted under the following conditions and then only after arranging to provide acceptable temporary utility services.
1. Notify Architect not less than 48 hours in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without receiving Architect’s written permission.

3. Existing utilities across or along the line of work are indicated only in an approximate location. Locate all underground lines and structures. Call “Miss Utility” at 1-800-552-7001 prior to construction. If utilities are marked that are not shown on the plans, locate utility vertically and horizontally and provide information to architect. Repair and correct any damage to underground lines and structures.

1.9 SAFETY

A. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

1. Operate warning lights as recommended by authorities having jurisdiction and governing regulations and standards.

2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Work within the road right-of-way shall meet all requirements of the latest edition of the Virginia Department of Transportation Work Area Protection Manual.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups CL, GC, SC, GW, GP, GM, SM, SW, and SP.

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups CH, OL, OH, MH, ML and PT.

C. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 4 inches in any dimension (2 inches for material used in trench backfill), debris, waste, frozen materials, organics, vegetation and other deleterious matter.

D. Imported material for structural fill shall comply with ASTM D2487 soil classification groups CL, ML, SC, SM, SP, SW, GC, GM, GP, or GW. Refer to the geotechnical report for additional information for CL soils and processed stone products.

2.2 ACCESSORIES
A. Non-woven Geotextile Fabric (for drainage): Mirafi 140N, or equivalent.
B. Woven Geotextile Fabric (for reinforcement): PROPEX 2002, or equivalent.

PART 3 – EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Section 311000 "Site Clearing."

C. Protect and maintain erosion and sedimentation controls during earthwork operations.

3.2 DEWATERING

A. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

   1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrade and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

   2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use utility trench excavations as temporary drainage ditches.

B. Should any springs or running water be encountered in the excavation, notify the Architect and provide discharge by trenches (or other acceptable means) and drain to an appropriate point of disposal. Provide temporary drainage facilities to minimize the flow of rainwater onto adjacent property. Repair any damage to property or to subgrade as a result of construction and/or dewatering (or lack thereof) operations at no additional cost to the Contract. If permanent provision must be made for disposal of water other than as indicated, the Contract price shall be adjusted.

3.3 EXPLOSIVES
A. Blasting may be done only if authorized by the Owner and local authorities having jurisdiction. When explosives are used, experienced powdermen or persons who are licensed or otherwise authorized to use explosives shall execute the work. Explosives shall be stored, handled, and used in accordance with local regulations and with the “Manual of Accident Prevention in Construction” of the Associated General Contractor of America, Inc. Correct any damage to foundations or other work caused by use of explosives. Meeting the requirements of the blasting permit, if issued, is a Contract responsibility.

3.4 EXCAVATION

A. Excavation consists of removal, placement and disposal of material encountered when establishing required subgrade or finish grade elevations.

1. Excavation includes removal and disposal of pavements and other obstructions visible on ground surface; underground structures, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.

B. Rock Excavation: If Rock is encountered the Owner's Geotechnical Engineer will verify that the material qualifies for classification as rock excavation.

1. If rock is encountered in grading, remove to depths as follows:
   a) Under surfaced areas, to 6” under the respective subgrade for such areas.
   b) Under grass and planted areas - 12” minimum.
   c) Under footings – Two feet below bottom of footing, One foot outside of perimeter of footing.
   d) Under trenches – 6” below bottom of trench.

2. Contractor shall employ a surveyor licensed in the Commonwealth of Virginia to calculate the quantity of material removed as Rock Excavation. The quantity of rock calculated shall not exceed the volume determined by the payment limits. The Owner's Project Representative shall review the quantity calculated within 48 hours of receiving the survey notes.

3.5 EXCAVATION FOR BUILDING PAD AND STRUCTURES

A. Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction and for review.

B. Excavations for footings and foundations: Do not disturb bottoms of excavation. Excavate by hand to elevations required just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.
1. Where rock is encountered, carry excavation to required elevations and backfill with crushed stone prior to installation of footing.

C. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot plus a sufficient distance to permit placing and removal of concrete formwork, installation of services, other construction and for review. Do not disturb bottom of excavations intended for bearing surface.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS
   A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

3.7 EXCAVATION FOR UTILITY TRENCHES
   A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches of clearance on both sides of pipe or conduit.
   B. Excavate trenches to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
      1. Where rock is encountered, carry excavation to required elevations and backfill with VDOT #57 crushed stone prior to installation of pipe.
      2. For pipes or conduit less than 6 inches in nominal size, and for flat-bottomed, multiple-duct conduit units, do not excavate beyond indicated depths. Hand-excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.
      3. For pipes and equipment 6 inches or larger in nominal size, shape bottom of trench to fit bottom of pipe for 90 degrees (bottom 1/4 of the circumference). Fill depressions with tamped sand backfill. At each pipe joint, dig bell holes to relieve pipe bell of loads ensure continuous bearing of pipe barrel on bearing surface.

3.8 EXCAVATION STABILITY
   A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.
   B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

3.9 SUBGRADE INSPECTION

A. Notify Architect when mass, trench and footing excavations have reached required subgrade. The Architect will arrange for an inspection of conditions by the Owner’s Geotechnical Engineer. Alternative procedures for arranging this review may be implemented at the Owner’s written option.

B. If the Owner’s Geotechnical Engineer determines that the subgrade bearing conditions are unacceptable, the Architect will authorize additional excavation until suitable bearing conditions are encountered.

C. Proof-roll subgrade below the building slabs and 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, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
   2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
   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.

D. Under supervision of the Owner’s Geotechnical Engineer, proofroll subgrade in cut areas below the building pad and pavement(s) with a loaded dump truck or other approved pneumatic tired vehicle. Should any unstable sub-soil be encountered below pavement or structures, break up the top eight inches of ground surface, pulverize, moisture-condition to optimum moisture content, and compact to percentage of maximum density as stated in Percentage of Maximum Density Requirements. Perform this work at no additional cost and/or time to the Contract.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated wafer, or construction activities, as directed by Architect, without additional compensation.

3.10 ADDITIONAL EXCAVATION

A. Additional Excavation (Mass): Remove excavated materials and dispose of off-site as directed by the Architect. Replace this excavated material with satisfactory material placed and compacted according to the requirements of the “Placement and Compaction” section.
B. Additional Excavation in Trenches: Remove excavated materials and dispose of off-site as directed by the Architect. Replace this excavated material with stone.

C. Additional Excavation in Footings: Remove excavated materials and dispose of off-site as directed by the Architect. Replace this excavated material with lean concrete/flowable fill or with stone extending 12 inches laterally beyond the footing in all directions.

D. The quantity of material removed as Additional Excavation (Mass, Trench or Footing) shall be calculated (on an in-situ basis) by a surveyor licensed in the Commonwealth of Virginia and employed by the Contractor. The Owner's Project Representative shall review the quantity calculated within 48 hours of receiving the survey notes.

E. Protect the subgrade during construction. During wet conditions, the subgrade soils may become saturated and soften, possibly resulting in damage to the subgrade if disturbed by equipment. Correct subgrade damaged in this manner. **No additional payment will be made to correct subgrade damaged in this manner.**

3.11 UNAUTHORIZED EXCAVATION

A. Correct Unauthorized Excavation as follows:

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to Architect.

2. Elsewhere, backfill and compact unauthorized excavations as indicated for authorized excavations of same classification unless otherwise directed by Architect.

3.12 STORAGE OF EXCAVATED MATERIALS

A. Temporarily stockpile excavated materials acceptable for use as backfill and fill. Place, grade, and shape stockpiles for proper drainage. Cover to prevent windblown dust.

1. Stockpile excavated materials away from edge of excavations. Do not store within the drip line of trees to remain.

3.13 BACKFILL AND FILL

A. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance by local authority having jurisdiction of construction below finished grade, including perimeter insulation.

2. Review, approval, and recording of the locations of underground utilities.
4. Removal of shoring and bracing (including backfilling of voids with satisfactory materials).
5. Removal of trash and debris from excavation.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow or ice.

C. Ground Surface Preparation: Remove vegetation, debris, obstructions, and deleterious materials from ground surface prior to placement of fills.

D. Bench sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material. Plow, scarify, bench or break up sloped surfaces flatter than 1 vertical to 4 horizontal so fill material will bond with existing material.

E. Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials indicated in Part 2 of this Section.

1. Under grassed areas, use satisfactory excavated or borrow material.
2. Under walks, curbs, and pavements, use satisfactory excavated or borrow material.
3. Under building slabs, use satisfactory excavated or borrow materials and drainage/porous fill material as indicated.

3.14 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.

C. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.

D. Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase.

E. Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the utility pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility 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 (300 mm) over the utility pipe or conduit.

G. Backfill voids with satisfactory soil while installing and removing shoring and bracing.

H. Place and compact final backfill of satisfactory soil to final subgrade elevation.

I. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

J. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

K. Do not backfill trenches until any required testing and inspections have been completed and Architect authorizes backfilling. Backfill carefully to avoid damage or displacement of pipe systems.

L. Under piping and conduit and equipment, use crushed stone where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 90 degrees of cylinder.

M. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

3.15 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percentage points of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percentage points and is too wet to compact to specified dry unit weight.

B. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations. Maintain the moisture content of the structural fill materials to within 2 percentage points of the optimum moisture content until permanently covered.

C. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to required density.

1. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by disking, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.
2. Work wet materials as directed by the Owner’s Geotechnical Engineer. Base bids on working material daily for a maximum of five days of acceptable weather.

3. No additional payment will be made for these operations.

3.16 COMPACTION OF SOIL BACKFILL AND FILLS
A. Place backfill and fill 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. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

C. Control soil and fill compaction, providing minimum percentage of density indicated for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Architect if soil density tests indicate inadequate compaction.

D. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density at a moisture content within 2 percentage points of optimum in accordance with ASTM D698:

1. Under structures, building pad and pavements, compact each layer of backfill or fill material at 95 percent maximum density. This includes ground under future expansion areas.

2. Under grass or unpaved areas, compact each layer of backfill or fill material at 90 percent maximum density.

E. Seal all fill areas at the end of each working day, utilizing a smooth drum roller.

3.17 GRADING
A. General: Rough grading of areas within the Project, including cut and fill sections and adjacent transition areas, shall be reasonably smooth, compacted and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from either blade-grader or motor patrol except as otherwise indicated. The finished subgrade surface from the grassed areas generally shall be not more than 0.2 feet above or below the final grade or approved cross section, with due allowance for topsoil.

B. The tolerance for areas within 10 feet of building perimeter, walks and all areas to be paved shall not exceed 0.10 feet above or below the established subgrade. Finish all ditches, swales and gutters to drain readily. Unless otherwise indicated, evenly slope the subgrade to provide drainage away from building walls in all
directions at a grade not less than ¼ inch per foot. Provide rounding at top and bottom of cut and fill slopes and at other breaks in grade.

C. Protection of Graded Areas: Protect newly graded areas and areas of cut, fill and design/subgrade elevations from the actions of the elements and from deterioration as a result of construction operations and weather conditions (frost, rains, snow, sleet, hail, etc.). Repair any settlement or washing that occurs prior to or after acceptance of the work. Fill to required subgrade levels any areas where settlement occurs. Protect trees to remain, and, at all areas of the Site where construction operations are in progress, provide protection for the safety of occupants of the existing facilities.

D. 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.

E. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1/2 inch (13 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

F. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.18 PAVEMENT SUBBASE COURSE:

A. General: Place subbase material, in layers of indicated thickness, over subgrade surface to support a pavement base course.

B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Shoulders: Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each subbase course layer. Compact and roll at least at 12” width of shoulder simultaneously with compacting and rolling each layer of subbase course.

D. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.
E. When a compacted subbase course is 6” thick or less, place material in a single layer. When more than 6” thick, place material in equal layers, except no single layer more than 6” or less than 3” in thickness when compacted.

F. Place subbase and base course on subgrades free of mud, frost, snow, or ice.

G. On prepared subgrade, place subbase and base course under pavements and walks as follows:
   1. Place base course material over subbase course under hot-mix asphalt pavement.
   2. Shape subbase and base course to required crown elevations and cross-slope grades.
   3. Place subbase and base course 6 inches (150 mm) or less in compacted thickness in a single layer.
   4. Place subbase and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
   5. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

H. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.19 BUILDING SLAB DRAINAGE COURSE

A. General: Place drainage/porous fill material, over subgrade surface to support concrete building slabs and sidewalks areas indicated.

B. Place drainage course on subgrades free of mud, frost, snow, or ice.

C. Placing: Place drainage/porous fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.

D. When a compacted drainage course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

3.20 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.
1. If in the opinion of the Architect, based on testing service reports and inspection, subgrade or fills have been placed that are below required density, perform additional compaction and testing until required density is obtained.

B. The Owner will engage, and pay for, the services of a Geotechnical Engineer whose function shall be to afford complete engineering control by testing of the conditions of all footing subgrades, the placement of all structural fills under structures, building pad and pavement areas, and all compaction where required, and to observe the proof rolling of the building pad and pavement areas.

C. The Owner’s Geotechnical Engineer will be present as deemed necessary during all phases of the Work requiring filling, compaction operations or testing. The Geotechnical Engineer will provide the Architect with written certification that fill and compaction was completed with accepted materials in accordance with the Documents, and give a professional opinion regarding shrinkage or settlement of fill and safe load bearing capacity of fill.

D. Site Preparation and Proofrolling: The Owner’s Geotechnical Engineer will determine if any additional excavation or in-place densification is necessary to prepare a subgrade for fill placement for slab or pavement support.

E. Fill Placement and Compaction: The Owner’s Geotechnical Engineer will witness all fill operations and take sufficient in-place density tests to verify that the indicated degree of fill compaction is achieved. The Owner’s Geotechnical Engineer will observe and approve borrow materials used and shall determine if their existing moisture contents are suitable/acceptable.

F. Footing Excavation Review: The Owner’s Geotechnical Engineer will review the footing excavations for the building foundations. He will verify that the design bearing pressures are available and that no loose or soft areas exist beneath the bearing surfaces of the footing excavations.

G. The Owner’s Geotechnical Engineer will submit two (2) copies each of his reports, recommendations and/or opinions to the Architect/Engineer and the Owner. Pertinent information will be provided to the Contractor as required.

3.21 EROSION CONTROL:

A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction, the Virginia Erosion and Sediment Control Handbook, and as indicated in the Contract Documents.

3.22 PROTECTION

A. Repair and reestablish grades in settled, eroded, and rutted areas to indicated tolerances.

B. Reconditioning Compacted Areas: Where subsequent construction operations or adverse weather disturbs completed compacted areas, scarify surface, reshape, and compact to required density prior to further construction.
C. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

D. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.23 DISPOSAL OF WASTE MATERIALS

A. Removal from Owner's Property: Remove excess and/or waste materials, including trash and debris, and dispose of it off Owner's property in a legal manner.

B. Dispose of excess material and materials not acceptable for use as backfill or fill legally offsite.

C. Do not remove topsoil from site until it has been demonstrated to the Owner's satisfaction that it is excess.

END OF SECTION 312000
SECTION 312500 - EROSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY
   A. This Section includes the installation, maintenance and removal of erosion control measures required for prevention of sediment leaving the project site.
   B. This Section also includes the requirement to file the Virginia Stormwater Management Program (VSMP) General Permit Registration Statement for Storm Water Discharges from Construction Activities with the State Department of Environmental Quality.

1.3 EROSION AND SEDIMENT CONTROL PERMIT
   A. Prior to commencement of work, obtain a copy of the approved Erosion and Sediment Control Plan from the City of Colonial Heights.
   B. Apply for the Land Disturbance Permit from the City of Colonial Heights.
   C. Post Erosion and Sediment Control Bond in the amount approved by the City of Colonial Heights.
   D. Schedule a pre-construction conference on-site with the Architect and City of Colonial Heights Environmental Inspector. Hold this meeting prior to the start of any construction activities.

1.4 VSMP REGISTRATION
   A. Prior to commencement of work, register/transfer the existing registration for the site with the State Department of Environmental Quality (DEQ)/ City of Colonial Heights per the requirements of the Virginia Stormwater Management Program (VSMP). The site must be registered to the Contractor's Responsible Land Disturber prior to the start of construction activities. Contractor is responsible for all VSMP related fees.
   B. Utilize the following process for registering the site:
      1. Complete the 2014 VSMP Registration Statement (DEQ 199-146) local reviewing agency form.
      2. Utilizing the approved Erosion and Sediment Control Plan as a base, prepare
the required Stormwater Pollution Prevention Plan (SWPPP). At a minimum, the additional information required on the SWPPP includes:

a) A description of any potential pollution sources such as vehicle fueling areas, storage of fertilizers and chemicals, and sanitary waste facilities. Identify the proposed location of these items on the site.

b) A description of the pollution prevention measures associated with these potential pollution sources.

c) The plan shall be labelled “Storm Water Pollution Prevention Plan”.

3. File the completed Registration Statement, Stormwater Pollution Prevention Plan and a registration fee with the Virginia Department of Environmental Quality.

C. During construction, the following requirements shall be met:

1. A copy of the Stormwater Pollution Prevention Plan (SWPPP) shall be kept at the job site at all times.

2. Amend the SWPPP as necessary to account for significant changes in design, construction or maintenance that would increase the pollution potential of the site. File a copy of the amended plan with DEQ and with the Architect.

3. The Responsible Land Disturber shall perform weekly inspections of the erosion and sediment control measures. Inspection reports shall be filed as an appendix to the SWPPP.

4. Contractor is responsible for required VSMP renewals.

D. Following final acceptance of the site by the Owner and sign off by the City of Colonial Heights Environmental Inspector, file a Notice of Termination with the Virginia Department of Environmental Quality/City of Colonial Heights.

1.5 SUBMITTALS

A. Responsible Land Disturber registration information.

B. A copy of the VSMP registration application and a copy of the Stormwater Pollution Prevention Plan. A copy of the VSMP transfer application.

C. Copies of the weekly Erosion Control Measure inspection reports. Inspection reports should be maintained in the onsite SWPPP binder for review at the monthly progress meetings.

D. A copy of the Notice of Termination with the Virginia Department of Environmental Quality/City of Colonial Heights.

E. Silt Fence

F. Safety Fence

1.6 PAYMENT PROCEDURES FOR EROSION CONTROL MEASURES
A. Establish a line item in the Schedule of Values for Erosion Control Maintenance. This line item shall represent a minimum of thirty percent (30%) of the total value of the erosion control for the project.

B. Erosion control maintenance will be paid on a monthly basis, following the satisfactory installation and maintenance of the erosion control measures.

PART 2 - PRODUCTS

2.1 EROSION CONTROL PRODUCTS:

A. Safety Fence
   1. Six foot high chain link fence, complying with the requirements of Standard and Specification 3.01 of the Virginia Erosion and Sediment Control Handbook.
   2. Post appropriate warning signs along the Safety Fence.

B. Construction Entrance
   2. Reinforced concrete wash-rack, draining to a sediment trap.
   3. The water source for washing operations shall be the responsibility of the Contractor.

C. Silt Fence
   2. Wooden stakes shall be 2” oak, a minimum length of five feet.

D. Wire Reinforced Silt Fence
   2. Wooden stakes shall be 2” oak, a minimum length of five feet.
   3. Wire fence reinforcement shall be a minimum of 14-guage and have a maximum mesh spacing of six inches.

E. Storm Drain Inlet Protection
   2. Gravel Curb Inlet Sediment Filter, complying with the requirements of Standard and Specification 3.07 of the Virginia Erosion and Sediment Control
Handbook.

F. Culvert Inlet Protection

G. Temporary Diversion Dike

H. Temporary Fill Diversion
   1. A channel with a berm on the lower side, placed at the top of a fill slope, complying with the requirements of Standard and Specification 3.10 of the Virginia Erosion and Sediment Control Handbook.

I. Diversion
   1. A channel with a berm on the lower side, stabilized with vegetation, complying with the requirements of Standard and Specification 3.12 of the Virginia Erosion and Sediment Control Handbook.

J. Temporary Sediment Trap

K. Temporary Sediment Basin
   1. A temporary pond, if used, with a controlled outfall release, shall comply with the requirements of Standard and Specification 3.14 of the Virginia Erosion and Sediment Control Handbook and to the details indicated on the Drawings.

   2. The pond shall be constructed for use as a permanent stormwater management facility. Conversion of the pond from a temporary to a permanent facility is required. Refer to the Basin Conversion Narrative on the drawings.

L. Temporary Slope Drain
   1. A flexible pipe extending from the top to the bottom of a fill slope, complying with the requirements of Standard and Specification 3.15 of the Virginia Erosion and Sediment Control Handbook.

   2. Pipe shall be smooth lined polyethylene, complying with the requirements of ASTM F667 or AASHTO M294.

M. Outlet Protection
   1. A level area of riprap, placed over filter fabric, complying with the requirements of Standard and Specification 3.18 of the Virginia Erosion and
Sediment Control Handbook.

N. Riprap
   2. The size of the stone required is indicated on the drawings.

O. Rock Check Dams
   1. Temporary stone dams constructed across a swale or ditch, complying with the requirements of Standard and Specification 3.20 of the Virginia Erosion and Sediment Control Handbook.
   2. Check dams shall be placed on filter fabric.

P. Dewatering Structure

Q. Temporary Seeding
   1. Temporary vegetative cover for disturbed areas, complying with the requirements of Standard and Specification 3.31 of the Virginia Erosion and Sediment Control Handbook.

R. Permanent Seeding
   1. Refer to Section “Lawns and Grasses” for permanent seeding requirements.

S. Soil Stabilization Blanket
   2. In lieu of plastic netting use East Coast Erosion Blankets (biodegradable single straw) or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION OF EROSION CONTROL MEASURES

A. Install all erosion and sediment control measures per the requirements of the Virginia Erosion and Sediment Control Handbook.

B. Protect all points of construction ingress and egress to the site to prevent tracking of mud onto public streets. Provide temporary construction entrances at all points of access to the site.

C. Clear only those areas necessary for installation of the perimeter erosion control
measures. The balance of the site shall not be cleared or otherwise disturbed until the perimeter erosion control measures are installed, functional and approved by the City of Colonial Heights Environmental Inspector.

D. Follow the construction sequence and install erosion control measures as indicated on the Drawings and as directed by the City of Colonial Heights Environmental Inspector.

E. Install additional measures as necessary to prevent sediment from leaving the project site.

3.2 MAINTENANCE OF EROSION CONTROL MEASURES

A. Maintain all erosion and sediment control measures per the requirements of the Virginia Erosion and Sediment Control Handbook.

B. At a minimum, the following maintenance is required:

1. Safety Fence
   a) Review fence regularly for damage. Repair any damage immediately.
   b) Secure the fence at the end of each working day. Repair or replace all locking devices as necessary.

2. Construction Entrance
   a) Wash and rework stone and/or place additional stone as required to prevent tracking of mud onto the roadways.
   b) Clean out the sediment-trapping device for the washrack.
   c) Remove all materials spilled, dropped, washed or otherwise tracked onto roadways or into storm sewers immediately. Do not use water trucks to wash the roadways.

3. Silt Fence
   a) Inspect immediately following each rainfall and at least daily during prolonged rainfall.
   b) Make any required repairs immediately. Give special attention to damage resulting from end-runs and undercutting.
   c) Replace fabric that is decomposing or is otherwise ineffective.
   d) Clean out accumulated sediment following every storm event. Do not allow sediment to accumulate higher than one-half the height of the barrier.

4. Wire Reinforced Silt Fence
   a) Inspect immediately following each rainfall and at least daily during prolonged rainfall.
   b) Make any required repairs immediately. Give special attention to damage resulting from end-runs and undercutting.
c) Replace fabric that is decomposing or is otherwise ineffective.
d) Clean out accumulated sediment following every storm event. Do not allow sediment to accumulate higher than one-half the height of the barrier.

5. Storm Drain Inlet Protection
   a) Inspect immediately following each rainfall and at least daily during prolonged rainfall.
   b) Remove and clean or replace stone filters that have been clogged with sediment. Make any required repairs immediately.
   c) Remove accumulated sediment as required. Do not allow sediment to accumulate higher than one-half the height of the measure.

6. Culvert Inlet Protection
   a) Inspect immediately following each rainfall and at least daily during prolonged rainfall.
   b) Remove and clean or replace stone filters that have been clogged with sediment. Make any required repairs immediately.
   c) Remove accumulated sediment as required. Do not allow sediment to accumulate higher than one-half the height of the measure.

7. Temporary Diversion Dike
   a) Inspect immediately following each rainfall and at least daily during prolonged rainfall. Inspect at least once every two weeks, whether or not it has rained. Make any necessary repairs immediately.
   b) Repair damages caused by construction activities by the end of each working day.

8. Temporary Fill Diversion
   a) Review measure at the end of each working day to ensure its effective operation.

9. Diversion
   a) Inspect diversion following every rainfall and at least once every two weeks.
   b) Remove accumulated sediment and make repairs as necessary.
   c) Re-seed as necessary to maintain vegetative cover.

10. Temporary Sediment Trap
    a) Remove sediment and restore the trap to its original dimensions once the sediment accumulates to the cleanout level. Refer to the drawings for the appropriate cleanout level elevations.
    b) Any pumping shall be discharged through an approved dewatering structure.
c) Remove and clean or replace stone choked with sediment.
d) Regularly check the structure to ensure that it is structurally sound.
   Immediately repair any damage discovered.

11. Temporary Sediment Basin
   a) Remove sediment and restore the basin to its original dimensions once the
      sediment accumulates to the cleanout level. Refer to the drawings for
      the appropriate cleanout level elevations.
   b) Any pumping shall be discharged through an approved dewatering
      structure.
   c) Regularly inspect the principal spillway and outfall for proper function.
      Regularly inspect the emergency spillway to ensure that its lining is well
      established and erosion resistant. Immediately repair any damage
      discovered.
   d) Regularly check the embankment to ensure that it is structurally sound.
      Immediately repair any damage discovered.

12. Temporary Slope Drain
   a) Inspect the temporary slope drains weekly and following every storm
      event. Immediately make any necessary repairs to ensure a free flow
      through the pipe.

13. Outlet Protection
   a) Inspect outlet protection following every storm event. Re-lay riprap as
      necessary to prevent concentrated flow from running across the outlet
      protection.

14. Riprap
   a) Inspect riprap following every storm event. Re-lay riprap as necessary to
      prevent concentrated flow from running under or around the riprap.
   b) Clean out accumulated sediment from the riprap.

15. Rock Check Dams
   a) Inspect immediately following each rainfall and at least daily during
      prolonged rainfall.
   b) Remove and clean or replace stone that has been clogged with
      sediment.
   c) Inspect for evidence of by-pass flows. Make any required repairs
      immediately.
   d) Remove accumulated sediment as required. Do not allow sediment to
      accumulate higher than one-half of the height of the dam.

16. Dewatering Structure
   a) Repair or replace the filtering media to prevent sediment accumulation
from affecting the filtering capacity of the structure.

17. Temporary Seeding
   a) Re-seed and mulch areas where cover is inadequate to protect against erosion until adequate cover is obtained.

C. Remove accumulated sediment as required and at appropriate intervals to maintain the effective function of all erosion control measures.

D. Inspect, repair and remove accumulated sediment from erosion control measures following significant (greater than ½") rainfall events.

E. If erosion control measures become clogged, causing the impoundment of water, restore the measures immediately. Ponded water poses a potential drowning hazard and shall be relieved immediately by either pumping (through an approved dewatering structure) or by removal of the blockage.

3.3 REMOVAL OF EROSION CONTROL MEASURES

A. Remove all temporary erosion control measures following the stabilization of the site. Do not remove erosion control measures until authorized by the City of Colonial Heights Environmental Inspector.

B. Topsoil, permanently seed and stabilize areas occupied by erosion control measures.

END OF SECTION 312500
SECTION 313116 - TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY
   A. This Section includes soil treatment for termite control.

1.3 SUBMITTALS
   A. Product data and application instructions.
   B. Certification that products used comply with U.S. Environmental Protection Agency (EPA) regulations for termiticides.

1.4 QUALITY ASSURANCE
   A. In addition to requirements of these specifications, comply with manufacturer’s instructions and recommendations for preparing substrate and application.
   B. Engage a professional pest control operator who is licensed according to regulations of governing authorities to apply soil treatment solution.
   C. Use only termiticides that bear a federal registration number of the EPA and are approved by local authorities having jurisdiction.

1.5 JOB CONDITIONS
   A. Restrictions: Do not apply soil treatment solution until excavating, filling, and grading operations are completed, except as otherwise required in construction operations.
   B. To ensure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

1.6 WARRANTY
   A. Warranty: Furnish written warranty, executed by Applicator and Contractor, certifying that applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
B. Warranty Period: 5 years from date of Substantial Completion. Also, include a renewable warranty for the Owner’s future consideration.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT SOLUTION:

A. Use an emulsifiable concentrate insecticide for dilution with water, specially formulated to prevent infestation by termites. Fuel oil will not be permitted as a diluent. Provide a working solution of one of the following chemical elements and concentrations:

1. Cypermethrin (Demon TC) 0.5% in water emulsion.

B. Other solutions may be used as recommended by Applicator and if acceptable to local governing authorities. Use only soil treatment solutions that are not injurious to planting.

PART 3 - EXECUTION

3.1 APPLICATION

A. Surface Preparation: Remove foreign matter that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placing compacted fill under slabs if recommended by toxicant manufacturer.

B. Application Rates: Apply soil treatment solution as follows:

1. Under slab-on-grade structures, treat soil before concrete slabs are placed, using the following application rates:

   a) Apply 4 gallons of chemical solution per 10 linear feet (5.1 L of chemical solution per meter) to soil in critical areas under slab, including entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers.

   b) Apply 1 gallon of chemical solution per 10 sq. ft. (4.1 L of chemical solution per sq. m) as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1-1/2 gallon of chemical solution per 10 sq. ft. (6.1 L of chemical solution per sq. m) to areas where fill is washed gravel or other coarse absorbent material.
c) Apply 4 gallons of chemical solution per 10 linear feet (5.1 L of chemical solution per meter) of trench for each 12 inches (300 mm) of depth from grade to footing, along outside edge of building. Dig a trench 6 to 8 inches (150 to 200 mm) wide along outside of foundation to a depth of not less than 12 inches (300 mm). Punch holes to top of footing at not more than 12 inches (300 mm) o.c. and apply chemical solution. Mix chemical solution with the soil as it is being replaced in the trench.

2. Under crawlspace and basement structures, treat soil along exterior and interior walls of foundations with shallow footings as specified above for exterior of slab-on-grade structures.

3. Treat soil under or around crawlspace structures as follows:
   a) Apply 4 gallons of chemical solution per 10 linear feet (5.1 L of chemical solution per meter) of trench along inside of foundation walls, along both sides of interior partitions, and around piers and plumbing. Do not apply an overall treatment in crawlspaces.
   b) Apply 4 gallons of chemical solution per 10 linear feet (5.1 L of chemical solution per meter) of trench, for each 12 inches (300 mm) of depth from grade to footing, along outside of foundation walls, including part beneath entrance platform porches, etc.
   c) Apply 4 gallons of chemical solution per 10 linear feet (5.1 L of chemical solution per meter) along the inside and outside of foundation walls of porches.
   d) Apply 1 gallon of chemical solution per 10 sq. ft. (4.1 L of chemical solution per sq. m) of soil surface as an overall treatment only where attached concrete platform and porches are on fill or ground.

4. At hollow masonry foundations or grade beams, treat voids at rate of 2 gallons per 10 linear feet 2.6 L per meter, poured directly into the hollow spaces.

5. At expansion joints, control joints, and areas where slabs will be penetrated, apply at rate of 4 gallons per 10 linear feet (5.1 L per linear m) of penetration.

C. Post signs in areas of application to warn workers that soil termiticide treatment has been applied. Remove signs after areas are covered by other construction.

D. Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application.

E. Allow not less than 12 hours drying time after application before beginning concrete placement or other construction activities.

END OF SECTION 313116
1.1 RELATED DOCUMENTS
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY
   A. This Section includes the following:
      1. Hot-mix asphalt paving over prepared subbase.
      2. Hot-mix asphalt patching.
      3. Hot-mix asphalt overlays.
      4. Asphalt surface treatments
         a) Coal tar sealant

1.3 SUBMITTALS
   A. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
   B. Material Certification: Certification signed by Contractor certifying that each material complies with requirements.
   C. Traffic maintenance and Work Area Protection Plan: Submit a plan indicating sequencing and measures to be used for the maintenance and protection of traffic during operations within or immediately adjacent to existing roadways open to vehicular traffic. The Architect and the City of Colonial Heights Public Works Department must approve this plan prior to commencement of work within the Right-of-Way.

1.4 QUALITY ASSURANCE
   A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
   B. Asphalt paving materials and installation shall conform to the requirements of the latest edition of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications and Road and Bridge Standards.
1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:

1. Prime and Tack Coats: Minimum ambient temperature of 50 deg F (10 deg C), and when temperature has not been below 35 deg F (1 deg C) for 12 hours immediately prior to application.

2. Asphalt Base Course: Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.

3. Asphalt Surface Course: Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.

1.6 TESTING AND INSPECTION

A. Within the road Right-of-Way, the City of Colonial Heights Public Works Department inspectors shall observe the asphalt placement. Coordinate the necessary inspection schedule with the City of Colonial Heights Public Works Department.

B. The Owner’s testing agency will observe the asphalt placement in the parking lots, bus loop, and on-site areas not in Right-of-Way. Coordinate the necessary inspection schedule with the Owner’s testing agency.

PART 2 - PRODUCTS

2.1 ASPHALT-AGGREGATE MIXTURE

A. General: Provide plant-mixed, hot-laid asphalt-aggregate mixture complying with the requirements of the VDOT Road and Bridge Specifications and as recommended by local paving authorities to suit project conditions.

2.2 ASPHALT MATERIALS

A. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

B. Prime Coat: Asphalt emulsion prime conforming to VDOT requirements.

2.3 AUXILIARY MATERIALS

A. Paving Geotextile: Nonwoven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

C. Notify Architect in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.2 MAINTENANCE AND PROTECTION OF TRAFFIC

A. Utilize flagmen, barricades, warning signs and warning lights as required by the Virginia Work Area Protection Manual.

3.3 PATCHING AND REPAIRS

A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.

1. Tack coat faces of excavation and allow to cure before paving.

2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.

B. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

C. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch (6 mm). Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

D. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or Portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m) of surface.

1. Allow tack coat to cure undisturbed before paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillage and clean affected surfaces.
3.4 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. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

C. Prime Coat: For asphalt sections less than 4” thick, apply uniformly over surface of compacted-aggregate base at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 24 hours minimum.
   1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use just 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.

3.5 GEOTEXTILE INSTALLATION

A. Apply bond coat, consisting of asphalt cement, uniformly to existing surfaces at a rate of 0.20 to 0.30 gal./sq. yd. (0.8 to 1.2 L/sq. m).

B. Place paving geotextile promptly according to manufacturer’s written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches (100 mm) and transverse joints 6 inches (150 mm).
   1. Protect paving geotextile from traffic and other damage and place overlay paving the same day.

3.6 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt mix 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 thickness indicated.
   2. Spread mix at minimum temperature of 225 deg F (107 deg C).

B. Place paving in consecutive strips not less than 10 feet (3 m) wide, except where 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 asphalt base course for a section before placing intermediate or surface courses.

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.

3.7 JOINTS

A. Construct joints between old and new pavement, or between successive days work, to ensure 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.

2. Offset longitudinal joints in successive courses a minimum of 6 inches (150 mm).

3. Offset transverse joints in successive courses a minimum of 24 inches (600 mm).

4. Construct transverse joints as required by the VDOT Road and Bridge Specifications.

5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.

3.8 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 vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and rerolling to required elevations.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve indicated density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 95 percent of reference laboratory density according to ASTM D 1559.
D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm. Surface course average density shall be 95 percent of reference laboratory density.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method. Edges adjacent to curbs and curb and gutter sections shall be flush with the edge of concrete.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected 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.

3.9 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Base Course: Plus or minus 1/2 inch (13 mm).
   2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
   1. Base Course: 1/4 inch (6 mm).
   2. Surface Course: 3/16 inch (3 mm).
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

C. Check surface areas at intervals as directed by Architect.

3.10 ASPHALT PAVEMENT OVERLAY

A. Refer to City of Colonial Heights Public standards and details for information regarding street overlay for utilities.

3.11 SEAL COAT FOR EXISTING PARKING LOT

A. Refer to civil sheets for information regarding the seal coat.

B. Apply seal coat in accordance with manufacturer’s specifications.
3.12 FIELD QUALITY CONTROL

A. Within the City Right-of-Way, coordinate required inspections with the City of Colonial Heights Public Works Department.

B. Testing Agency: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
   1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with requirements.

D. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with requirements.

END OF SECTION 321216
SECTION 321313 - SITE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 DESCRIPTION OF WORK:
   A. Extent of Portland cement concrete paving is shown on drawings, including:
      1. Curbs and gutters
      2. Walkways

1.3 SUBMITTALS
   A. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
   B. Material Certification: Certification signed by Contractor certifying that each material complies with requirements.
   C. Concrete scoring plan.

1.4 JOB CONDITIONS
   A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MATERIALS
   A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
      1. Use flexible spring steel forms or laminated boards to form radius bends as required.
      2. Coat forms with a nonstaining form release agent that will not discolor or deface surface of concrete.
   C. Reinforcing Steel: ASTM A 615, Grade 60, deformed
D. Concrete Materials: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

E. Expansion Joint Materials: Comply with requirements of applicable Division 7 sections for preformed expansion joint fillers and sealers.

F. Antispalling Compound: Combination of boiled linseed oil and mineral spirits, complying with AASHTO M-233.

G. Liquid-Membrane Forming and Sealing Curing Compound: Comply with VDOT Road and Bridge Specifications.

2.2 CONCRETE MIX, DESIGN, AND TESTING

A. Comply with requirements of applicable Division 3 sections for concrete mix design, sampling and testing, and quality control or VDOT Road and Bridge Specifications whichever is more stringent.

B. Design mix to produce normal-weight concrete consisting of Portland cement, aggregate, water-reducing or high-range water-reducing admixture (superplasticizer), air-entraining admixture, and water to produce the following properties:

1. Comply with the requirements of VDOT Std. Class A3 Concrete, unless otherwise indicated.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

B. Proof-roll prepared subbase surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

3.2 FORM CONSTRUCTION

A. Set forms to required grades and lines, braced and secured. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork for grade and alignment to following tolerances:

1. Top of forms not more than 1/8 inch in 10 feet.

2. Vertical face on longitudinal axis, not more than 1/4 inches in 10 feet.
C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.3 REINFORCEMENT

A. Locate, place and support reinforcement as specified in Division 3 sections, unless otherwise indicated.

3.4 CONCRETE PLACEMENT

A. General: Comply with requirements of applicable Division 3 sections for mixing and placing concrete or VDOT Road and Bridge Specifications whichever is more stringent.

B. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required 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.

C. Place concrete by methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with 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 dislocation of reinforcing, dowels, and joint devices.

D. Deposit and spread concrete in a continuous operation between transverse joints as far as possible. If interrupted for more than 1/2 hour, place a construction joint.

E. Fabricated Bar Mats: Keep mats clean and free from excessive rust, and 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 to adjacent mats.

F. Place concrete in 2 operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

G. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Architect.

H. Curbs and Gutters: Automatic machine may be used for curb and gutter placement. If machine placement is to be used, submit revised mix design and laboratory test results that meet or exceed minimums indicated. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish, and jointing as indicated for formed concrete. If results are not acceptable, remove and replace with formed concrete meeting requirements.
3.5 JOINTS

A. General: Construct expansion, weakened-plane (contraction), and construction joints true to line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into approximately 10' areas or as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.

2. Sawed Joints: Form weakened-plane joints with powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.

C. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for more than 1/2 hour, except where such placements terminate at expansion joints.

1. Construct joints as indicated or, if not indicated, use standard metal keyway-section forms.

D. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks, and other fixed objects, unless otherwise indicated.

E. Locate expansion joints at 50 feet o.c. for each pavement lane unless otherwise indicated.

F. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.

G. Provide joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.

H. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

I. Fillers and Sealants: Comply with requirements of applicable Division 7 sections for preparation of joints, materials, installation, and performance.
3.6 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10-ft. straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2-inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and when excess moisture or surface sheen has disappeared, complete troweling and finish surface as follows:
   1. Broom finish by drawing a fine-hair broom across concrete surface perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Architect.
   2. Exposed-Aggregate Finish: At handicap ramps and where indicated on drawings, by applying an approved retardant curing compound to the surface. Allow minimum 12 hours of setting time before washing surface to expose a maximum of (1/3) one-third of stone surface. Aggregate shall be brown Riverstone having a uniform size and color for each subsequent concrete pour. Aggregate size shall range between 1/2" and 3/4".

E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.

3.7 CURING

A. Protect and cure finished concrete paving in compliance with applicable requirements of Division 3 sections. Use membrane-forming curing and sealing compound or approved moist-curing methods.

3.8 REPAIRS AND PROTECTIONS

A. Repair or replace cracked, broken or defective concrete curbs and curb and gutter, as directed by Architect.

B. Replace cracked, broken or defective concrete sidewalks.

C. Repair or replace cracked, broken or defective concrete pavement, as directed by Architect.

D. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.
E. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

F. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just before final inspection.

END OF SECTION 321313
SECTION 321700 - PAVEMENT MARKINGS, SIGNS AND SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY
   A. This Section includes, but is not limited to, the following:
      1. Establishing the location of pavement markings and applying pavement markings for parking space lines, traffic control, fire lane and accessible spaces.
      2. Installation of signs for traffic control and accessible spaces.
      3. Installation of wheel stops at parking spaces.

1.3 QUALITY ASSURANCE
   A. All work and materials shall conform to the requirements of the latest edition of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications, VDOT Road and Bridge Standards, and the City of Colonial Heights standard details.
   B. All materials for signs shall conform to the requirements of the latest edition of the Virginia Department of Transportation (VDOT) Road and Bridge Specifications and Road and Bridge Standards and to the requirements of the latest edition of the Manual of Uniform Traffic Control Devices for traffic signs.
   C. Installer Qualifications: Engage an experienced installer, who has successfully completed striping and signage projects similar in size and complexity to this project. The installer’s primary business (defined as a minimum of 60% of total billings) shall be striping and signage.

1.4 SUBMITTALS
   A. Product Data and written confirmation that the following materials are included on VDOT’s list of approved construction materials:
      1. Pavement marking paint
      2. Wheel stops
      3. Signs
      4. Posts
PART 2 - PRODUCTS

2.1 PAVEMENT MARKING PAINT

A. Paint shall be Type A, water emulsion base, traffic paint conforming to the requirements of Section 704 of the VDOT Road and Bridge Specifications and Federal Specification TT-P-1952. Color shall be white unless otherwise indicated.

B. Curb painting color along fire lanes shall be yellow, unless otherwise indicated.

C. Type B thermoplastic lane markings are required within VDOT rights-of-way.

2.2 PAINT APPLICATOR

A. Provide hand-operated push-type applicator machine of a type commonly used for application of paint to pavement surfaces. Paint applicator machine shall be acceptable for marking small street and parking areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified.

2.3 WHEEL STOPS

A. Wheel stops shall be made of 3,000 psi precast concrete and be 6 inches high, 8 inches wide and approximately 6 feet long. Provide chamfered corners and edges and two holes for anchoring.

2.4 SIGNS AND POSTS

A. Signs shall conform to the requirements of Section 701 of the VDOT Road and Bridge Specifications. Signs shall be fabricated with encapsulated lens sheeting.

B. Signposts for traffic control signage shall be 4" x 4" treated wood conforming to the requirements of Section 236 of the VDOT Road and Bridge Specifications.

C. Utilize metal posts for fire-lane signage and for signage at accessible parking spaces.

2.5 CONCRETE

A. Concrete shall be Class A3, General concrete, conforming to the requirements of Section 217 of the VDOT Road and Bridge Specifications.
PART 3 - EXECUTION

3.1  SURFACE PREPARATION FOR PAVEMENT MARKING
    A. Apply pavement markings only when the ambient temperatures is above 50°F and less than 95°F, unless otherwise approved.
    B. Allow pavement to cure for a period of not less than 7 days before applying pavement marking.
    C. Clean surfaces thoroughly before application of paint. Remove, dust, dirt and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods as required.
    D. Remove existing pavement markings, residual curing compounds and other coating adhering to the pavement with scrapers, wire brushes, waterblasting, sandblasting or mechanical abrasion as required. Areas of existing pavement affected by oil or grease shall be scrubbed with an approved chemical and rinsed thoroughly. Seal oil soaked areas with shellac or primer after cleaning.
    E. Pavement surfaces shall be dry and clean prior to painting. Pavement markings shall not be applied within 24 hours following rain or other inclement weather or when rain is imminent.

3.2  APPLICATION OF PAVEMENT MARKING
    A. Apply paint in accordance with the requirements of Section 704 of the VDOT Road and Bridge Specifications.
    B. Lay out lines and markings to the width and length as indicated. All parking space lines shall be 4 inches wide.
    C. Apply paint with an approved paint applicator.
    D. Apply paint at manufacturer recommended rates to provide a minimum 15 mil wet thickness (depending on manufacturer, may require 2 applications).

3.3  FIRE LANE MARKINGS AND SIGNAGE
    A. Mark fire lanes and install fire lane signage in accordance with the requirements of the local Fire Marshall and as indicated on the drawings.

3.4  INSTALLATION OF WHEEL STOPS
    A. Secure wheel stops with two 1/2-inch diameter steel reinforcing rods. Rods shall be a minimum of 18 inches in length and be embedded into the pavement, base and subgrade a minimum of 12 inches and be flush with the top of the bumper block.
3.5 INSTALLATION OF SIGNS
   A. Install signs on signposts in accordance with the requirements of Section 701 of the VDOT Road and Bridge Specifications.
   B. Install sign posts in concrete foundation to a depth of 3 feet minimum by 12 inches in diameter.

END OF SECTION 321700
SECTION 323113.19 –CHAIN-LINK FENCES AND GATES (PVC CLAD)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 WORK INCLUDED
   A. Polyvinyl Chloride (PVC) clad chain link fence and gates.
   B. Epoxy painted posts and rails.

1.3 SUBMITTALS
   A. Product Data: Submit manufacturer’s technical data and installation instructions for fencing, fabric, gates, paint, and accessories.
   B. Shop Drawings: Submit shop drawings indicating location of fence (with dimensions), height, post locations, details of post installation, gate swing, hardware and accessories. Identify PVC touch up paint.
   C. Samples: None required

1.4 QUALITY ASSURANCE
   A. Installer Qualifications: Engage an experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
   B. Source Limitations for Chain-Link Fences and Gates: Obtain each color, grade, finish, type, and variety of component for chain-link fences and gates from one source with resources to provide chain-link fences and gates of consistent quality in appearance and physical properties.

1.5 PROJECT CONDITIONS
   A. Field Measurements: Verify layout information for chain-link fences and gates indicated in relation to property survey and existing structures. Verify dimensions by field measurements.
PART 2 - PRODUCTS

2.1 GENERAL:
A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
   1. PVC Coated Steel Fencing and Fabric:
      a) Colorguard Fence Products, Inc.
      b) American Chain Link Fence Company
      c) Semmerling Fence & Supply, Inc.
      d) Anchor Fence, Inc.
   2. Epoxy Paint for Fence/Gate Posts, Rails, and Hardware
      a) PPG Aquapon WB 98-1 Series or approved substitute
         (1) Gloss or Semi-Gloss Black

2.2 FABRIC:
B. Size: 2-inch diamond mesh, 9-gauge (0.148-inch diameter) wire.
C. PVC Coating: ASTM F668, Class 2B (fused and adhered) PVC coating, black color. Bonded or extruded & glued fabric may not be used.
D. Selvage shall be knuckled at the top and bottom.

2.3 FRAMING:
A. Strength requirements for posts and rails shall conform to ASTM F 669.
B. Pipe shall be straight, true to section, material and sizes specified.
C. Steel Framework, General: Posts, rails, braces and gate frames.
   1. Type II Pipe: Manufactured from steel conforming to ASTM A 569 or A 446, grade D, cold formed, electric welded with minimum yield strength of 50,000 p.s.i. and triple coated with minimum 0.9 oz. Zinc per square foot after welding, a chromatic conversion coating and a clear polymer overcoat. Corrosion protection on inside surfaces shall protect the metal from corrosion when subjected to the salt spray test of ASTM B 117 for 300 hours with the end point of 5% Red Rust.
2. PVC-Coating finish: In accordance with ASTM F668, Class 2B (fused and adhered) apply supplemental color coating of 10 to 15 mils (0.254 – 0.38mm) of thermally fused PVC in color to match fabric.

D. End, Corner and Pull Posts:
   1. For fabric height up to 6' - 2.375" OD Type II steel pipe (3.12 lb/ft). [2.875", 73mm, 5.79 lb/ft.]
   2. For fabric height 6' and over - 2.875" OD Type II steel pipe (4.64 lb/ft). [4.00", 101.6mm, 9.11 lb/ft]

E. Line Posts:
   1. For fabric height up to 6' - 1.90" OD Type II steel pipe (2.28 lb/ft).
   2. For fabric height 6' and over - 2.375" OD Type II steel pipe (3.65 lb/ft).

F. Gate Posts:
   1. Provide posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:
      a) 6' or Under: 2.875" OD Type II steel pipe (4.64lb/ft).
      b) 6' and over: 4.000" OD Type II steel pipe (8.65 lb/ft).

G. Top & Bottom Rail:
   1. Manufacturer’s longest lengths, with expansion-type couplings, approximately 6” long, for each joint. Provide means for attaching rail securely to each gate corner, pull, & end post.
      a) 1-1/4" NPS (1.66" OD) Type II steel pipe.

H. Intermediate and/or Center Rail:
   1. Same material as top rail. Manufacturer’s standard galvanized steel cap required for each end.

2.4 FITTINGS AND ACCESSORIES:

A. Material: Comply with ASTM F 626. Mill finished galvanized steel, to suit manufacturer’s standards.
   1. Zinc Coating: Unless specified otherwise, galvanize steel fence fittings and accessories in accordance with ASTM A 153, with zinc weights indicated.
   2. Supplemental Color Coating: In accordance with ASTM F668, Class 2B (fused and adhered), apply supplemental color coating of 10 to 15 mils (0.254 – 0.38mm) of thermally fused PVC in color to match fabric. Apply to exterior surfaces and, except inside cap shapes, to exposed interior surfaces. Color to match chain link fabric.

B. Tension Wire: 7 gauge (0.177" diameter) metallic coated steel marcelled tension wire conforming to ASTM A 824 with finish to match fabric.
1. PVC-Coated finish: In accordance with ASTM F668, Class 2B (fused and adhered), apply supplemental color coating of 10 to 15 mils (0.254 – 0.38mm) of thermally fused PVC in color to match fabric.

C. Wire Ties:
1. 9 gauge [0.148" (3.76mm)] galvanized steel wire for attachment of fabric to line posts.
2. Double wrap 13 gauge [0.092" (2.324mm)] for rails and braces.
3. Hog ring ties of 12-1/2 gauge [0.0985" (2.502mm)] for attachment of fabric to tension wire

D. Post Brace Assembly:
1. Manufacturer’s standard adjustable brace at end of gate posts and at both sides of corner and pull posts, with horizontal brace located at mid height of fabric. Provide same material as top rail for brace, and truss to line posts with 0.375" diameter rod and adjustable tightener. Manufacturer’s standard galvanized steel cap required for each end.

E. Post and Line Caps: Weathertight closure cap required for each post. If top rail is required, use line post caps with loop.

F. Tension or Stretcher Bars: Hot-dip galvanized steel with minimum length 2" less than full height of fabric, minimum cross section of 3/16" by ¾" and minimum 1.2 oz. zinc coating per sq. ft. of surface area. One bar is required for each gate and end post and two for each corner and pull post, except where fabric is integrally woven into post.

G. Tension and Brace Bands: Minimum ¾" wide hot-dip galvanized steel with minimum 1.2 oz. zinc coating per sq. ft. of surface area.
1. Tension bands: Minimum 14 gauge (0.074") thick.
2. Tension and Brace bands: Minimum 12 gauge (0.105") thick.

H. Nuts and bolts shall be galvanized but not vinyl coated. Provide touch up paint and color coat nuts and bolts to match fabric.

2.5 POST SETTING MATERIALS
A. Comply with the requirements for VDOT Std. Class A3 concrete.

2.6 GATES:
A. Fabrication:
1. Fabricate perimeter frames of gates from metal and finish to match fence framework. Utilize Fusion or stainless steel welded connections to form a rigid one-piece unit. Assemble gate frames by welding, providing security against removal or breakage connections. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware and
accessories. Space frame members maximum of 8’ apart unless otherwise indicated.

2. Provide same fabric as for fence. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretcher hooks to gate frame at not more than 15” o.c.

3. Install diagonal cross-bracing consisting of 3/8” diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.

B. Swing Gates: Comply with ASTM F 900.
   1. Fabricate perimeter frames of minimum 1.90” OD Type II steel pipe.

C. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A 153, and in accordance with the following:
   1. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180 degrees gate opening. Provide 1-1/2 pair of hinges for each leaf over 6’ nominal height.
   2. Latch: Forked type to permit operation from either side of gate, with padlock eye as integral part of latch.
   3. Keeper: Provide keeper that automatically engages gate leaf and holds it in open position until manually released.
   4. Double Gates: Provide gate stops for double gates, consisting of mushroom type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar. Ensure plunger bar cannot be removed without tools. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.
   5. Hardware materials: Provide hot dipped galvanized steel or malleable iron shapes to suit gate size. Field coat hardware parts (e.g. hinges, latch, keeper and drop bar) with PVC touch up paint, provided by manufacturer, to match adjacent finishes.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Install fence in compliance with ASTM F 567 and manufacturers recommendations. Do not begin installation and erection before final grading is completed, unless otherwise permitted. Apply fabric to outside of framework, unless otherwise indicated.

B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30º or more, or as indicated on plans.

C. Excavation:
1. Drill or hand excavate (using post hole digger) holes for posts to diameters and spacing indicated, in firm, undisturbed or compacted soil.

2. Holes in asphalt or concrete surfaces will be cut by core-drilling with a bit of diameter at least equal to the required hole diameter. Holes in concrete may be formed prior to placing concrete.

3. Excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than 4 times largest cross-section of post.

4. Excavate hole to depths approximately 6" lower than post bottom, with bottom of posts set not less than 36" below finish grade surface.

D. Setting Posts:
   1. Space 10' o.c. maximum, unless otherwise indicated.
   2. Center and align posts in hole, 6" above bottom of excavation.
   3. Protect portions of concrete posts above ground from concrete splatter. Place concrete around post and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
   4. Extend concrete above grade and slope all around (dome) to allow for drainage away from post. Uniformly and neatly texture the concrete surface with a broom finish. Remove any spilled or splashed concrete from the post and surrounding area immediately.

E. Top Rails:
   1. Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.

F. Center Rails:
   1. Install in one place between posts and flush with post on fabric side, using rail ends and special offset fittings where necessary. Provide center rails for fence 12' or taller, or as indicated on drawings.

G. Bottom Rails:
   1. Install in one piece between posts and flush with post on fabric side, using rail ends and special offset fittings when necessary.

H. Brace Assemblies:
   1. Install braces so posts are plumb when diagonal rod is under proper tension.

I. Top and Bottom Tension Wire:
   1. Install tension wires through post cap loops before stretching fabric and tie to each post cap with not less than same gauge and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire, using 11 - ga. galvanized
steel hog rings spaced maximum 24" o.c. Install where top and/or bottom rails are not specified on plans.

J. Fabric:

1. Leave approximately 2" between finish grade and bottom selvage. Pull fabric taut and tie to posts, rails and tension wires. Attach fabric with wire ties to line posts at 12"-15" (381mm) o.c. and to rails, braces, and tension wire at 24" (600 mm) o.c. Install fabric on security side of fence, unless otherwise indicated, and anchor to framework so that fabric remains in tension after pulling force is released.

2. For athletic field fencing, install fabric on the field side of the fence unless otherwise indicated.

K. Stretcher Bars:

1. Thread through fabric 4" o.c., and secure to end, corner, pull and gate posts with tension bands spaced maximum 15" o.c.

L. Accessories

1. Tie Wires: Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing.

M. Fasteners:

1. Install nuts for tension bands and hardware bolts on site of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

N. Gates:

1. Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.2 FINISHING

A. Remove and replace sections of fence and fittings with damaged PVC coating. Minor aesthetic damage may be touched up with a suitable spray on material provided by the manufacturer.

B. Prepare and paint fence/gate posts, rails, and hardware according to paint manufacturer’s specifications.

C. Clean up debris and unused material and remove from the site.

END OF SECTION 323113.19
SECTION 329200 - LAWNS AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY
   A. This Section includes the following:
      1. Fine grading and preparing lawn areas
      2. Topsoil Placement
      3. Soil amendments
      4. Fertilizers
      5. Lawn Seeding
      6. Lawn Restoration

1.3 DEFINITIONS
   A. Finish Grade: Elevation of finished surface of planting soil.
   B. Lawns: All areas disturbed by construction and not otherwise covered by paving, buildings or other structures.

1.4 SUBMITTALS
   A. Certification by product manufacturer that the following products supplied comply with requirements:
      1. Grass Seed
         a) Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
         b) Certification letter from supplier that the seed is Blue Tag Certified.
      B. Installers qualifications
         1. Provide a list, with references, of the past three projects of a similar magnitude.
      C. Topsoil Amendment Plan.
         1. Provide copy of topsoil testing report.
2. List of amendments proposed for topsoil, including application rates.

1.5 QUALITY ASSURANCE
   A. Installer Qualifications: Engage an experienced installer, who has successfully completed lawn establishment projects similar in size and complexity to this project. The installer's primary business (defined as a minimum of 60% of total billings) shall be establishment of lawns.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.7 COORDINATION AND SCHEDULING
   A. Lawn Planting Season: Sow lawn seed during normal planting seasons for type of lawn work required.
      1. Spring Planting Season: March 15 through May 15
      2. Fall Planting Season: September 15 through November 15
   B. Lawn Seeding Schedule
      1. If job completion schedule does not allow seeding within a normal planting season, provide interim temporary seeding necessary to stabilize site. Complete permanent seeding during the next planting season.
   C. Weather Limitations: Proceed with planting only when existing and forecast weather conditions are suitable for work.

1.8 LIMITS OF SEEDING
   A. Seed all lawn areas not otherwise indicated.

1.9 LIMITS OF LAWN RENOVATION
   A. All existing lawn areas disturbed by construction activities.

1.10 PAYMENT PROCEDURES FOR LAWNS AND GRASSES
   A. Establish a line item in the Schedule of Values for Lawn Maintenance. This line item shall represent a minimum of thirty percent (30%) of the total value of the seeding for the project.
   B. Lawn maintenance will be paid on a monthly basis, following the satisfactory maintenance of the lawns.
PART 2 – PRODUCTS

2.1 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1" or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

   a) Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.

B. Have topsoil tested by a certified soil testing laboratory to determine the type and quantity of soil amendments necessary. Add amendments to topsoil as necessary to meet these requirements.

2.2 INORGANIC SOIL AMENDMENTS

A. If the topsoil analysis indicates the need for inorganic soil amendments, the following standards apply:

B. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

1. Class: Class O, with a minimum 95 percent passing through No. 8 (2.36-mm) sieve and a minimum 55 percent passing through No. 60 (0.25-mm) sieve.

2. Provide lime in form of dolomitic limestone.

C. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 (3.35-mm) sieve and a maximum 10 percent passing through No. 40 (0.425-mm) sieve.

D. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

E. Aluminum Sulfate: Commercial grade, unadulterated.

F. Perlite: Horticultural perlite, soil amendment grade.

G. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.

H. Sand: Clean, washed, natural or manufactured, free of toxic materials.

I. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
J. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.3 ORGANIC SOIL AMENDMENTS

A. If the topsoil analysis indicates the need for organic soil amendments, the following standards apply:

B. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch (19-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
3. Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.
4. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
5. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.4 FERTILIZER

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in topsoil analysis reports from a qualified soil-testing agency.
2. Minimum Composition: No less than 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2.5 LAWN SEED

A. All grass seed must be fresh, clean, and dry.

B. Seed Species

<table>
<thead>
<tr>
<th>Proportion by Weight</th>
<th>Grass Species</th>
<th>Min. % Germination</th>
<th>Min. % Pure Seed</th>
<th>Max. % Weed Seed</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>Kentucky bluegrass (Poa pratensis)</td>
<td>80</td>
<td>85</td>
<td>0.50</td>
</tr>
<tr>
<td>90%</td>
<td>Tall Fescue (Festuca arundinacea)</td>
<td>85</td>
<td>98</td>
<td>0.50</td>
</tr>
</tbody>
</table>

A. Varieties shall be selected from the most recent list of recommended turfgrass varieties, published by Virginia Tech.

B. All seed shall be Blue Tag certified by the Oregon State Seed Laboratory. Tags must be attached to each bag delivered on site.

2.6 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Peat Mulch: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.

C. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

D. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

2.7 EROSION-CONTROL MATERIALS

A. Erosion-Control Fiber Mesh: Biodegradable twisted jute or spun-coir mesh, a minimum of 0.92 lb/sq. yd. with 50 to 65 percent open area. Include manufacturer’s recommended steel wire staples, 6 inches long.
PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine areas to receive lawns and grass for compliance with requirements and for conditions affecting performance of the Work. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
C. Protect adjacent and adjoining areas from hydroseed overspraying.

3.3 TOPSOIL PLACEMENT FOR LAWNS
A. Limit subgrade preparation to areas that will be planted in the immediate future.
B. Loosen subgrade to a minimum depth of 4 inches. Remove stones, sticks and roots larger than 2 inches in any dimension from subgrade. Completely remove trash and other extraneous debris from subgrade.
C. Have topsoil tested by a certified soil testing laboratory to determine the type and quantity of soil amendments necessary.
D. Sift topsoil to remove stones and other objects larger than 1” in any dimension. Maximum object size for topsoil shall be achieved by sifting not by hand removal or raking following placement of topsoil.
E. Mix soil amendments and fertilizers with topsoil at rates required by soil testing. Delay mixing fertilizer if planting does not follow placing of planting soil within 4 days. Either mix soil before spreading or apply soil amendments on surface of spread topsoil and mix thoroughly into top 4 inches of topsoil before planting.
F. Mix lime with dry soil prior to mixing fertilizer.
G. Spread topsoil to a minimum depth of six inches (6”).

3.4 SEEDING LAWNS
A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.
B. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
C. Sow seed at the following rates:
   1. Seeding Rate: 200 lbs./acre.

D. Rake seed lightly into top 1/4 inch of topsoil, roll lightly, and water with fine spray.

E. Hydroseed all slopes 3:1 or steeper.

F. Protect seeded areas 3:1 slope/grade or steeper against erosion by providing erosion-control blankets installed and stapled according to manufacturer's recommendations.

G. Protect seeded areas less than 3:1 slope/grade against erosion by spreading straw mulch after completion of seeding operations. Spread uniformly at a minimum rate of 2 tons per acre to form a continuous blanket 1-1/2 inches (38 mm) loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
   1. Anchor straw mulch by crimping into topsoil by suitable mechanical equipment.

3.5 LAWN RENOVATION

A. Renovate existing lawn damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
   1. Reestablish lawn where settlement or washouts occur or where minor regrading is required.

B. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury in soil.

C. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.

D. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

E. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

F. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.

G. Apply soil amendments and initial fertilizers required for establishing new lawns and mix thoroughly into top 4 inches of existing soil. Provide new planting soil to fill low spots and meet finish grades.

H. Apply seed and protect with straw mulch as required for new lawns.

I. Water newly planted areas and keep moist until new lawn is established.
3.6 MAINTENANCE OF NEW LAWNS

A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established. Maintain seeded lawns until Substantial Completion. Maintain all grassed areas as necessary to ensure a satisfactory lawn is achieved at Substantial Completion.

B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
   1. Replant bare areas with same materials as for lawns.
   2. Replace disturbed mulch.

C. Watering: Provide and maintain temporary hoses, and lawn-watering equipment to convey water from a water source to keep lawns uniformly moist to a depth of 4 inches.
   1. Provide a source of water for irrigation. Utilize temporary irrigation meters, a well or water trucks as necessary for the water source.
   2. Water seeded areas as necessary to promote vigorous growth of grass but at the minimum rate of 1 inch per week.

D. At a minimum, the following fertilizer applications are required:
   1. By November 30 of the first year apply 15-5-10 commercial fertilizer at the rate of 200 lbs. per acre over all seeded areas.
   2. By March 30 of the next Spring, apply 15-5-10 commercial fertilizer at the rate of 350 lbs. per acre over all seeded areas.
   3. By November 30 of the same year, apply 15-5-10 commercial fertilizer at the rate of 200 lbs. per acre and apply lime at 2000 lbs. per acre over all seeded areas.
   4. Provide written acknowledgement that this requirement has been met prior to requesting Substantial Completion.

E. Mow lawns as soon as there is enough top growth to cut with mower set at indicated height. Repeat mowing as required to maintain indicated height without cutting more than 40 percent of the grass height (minimum of 3 mowings). Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain following grass height:
   1. Mow grass to a finished height of 2 to 3 inches high.

F. Apply pre-emergent herbicide to lawns areas. Apply 60 – 90 days after planting.
3.7 SATISFACTORY LAWN

A. Seeded lawns shall be considered satisfactory/acceptable provided requirements, including maintenance, have been met and a healthy, uniform, close stand of grass is established, free of weeds, bare spots exceeding 5 by 5 inches and surface irregularities.

B. Replant lawns that do not meet requirements and continue maintenance until lawns are satisfactory/acceptable.

C. Substantial Completion of the building and the remainder of the project may be achieved (pending prior Architect and Owner approval) before achieving a satisfactory/acceptable lawn. Continue to replant and maintain unsatisfactory/unacceptable lawn areas until acceptance is obtained. Warranties for lawns shall begin at the time of acceptance of the lawn.

3.8 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from sidewalks and paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto surface of roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period until lawn is established.

END OF SECTION 329200
SECTION 329300 - EXTERIOR PLANTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY
   A. This Section includes the following:
      1. Trees
      2. Shrubs
      3. Groundcovers
      4. Other Plant Materials
      5. Stakes & Guys

1.3 SUBMITTALS
   A. Installers Qualifications: Provide a list, with references, of the past three projects of similar scope.
   B. Product Data: For each type of product indicated.
   C. Plant Material Certifications:
      1. Certificates of inspection as required by governmental authorities.
      2. Label data substantiating that plant materials comply with specified requirements.
   D. Planting Schedule:
      1. Typewritten planting schedule.
      2. Once accepted, revise dates only as approved in writing and submitted to Architect.
   E. Maintenance Schedules: Typewritten instructions recommending procedures for maintenance of landscape work for one full year. Submit prior to completion of project.

1.4 QUALITY ASSURANCE
   A. Installer Qualifications: Engage an experienced installer, who has successfully completed planting projects similar in size and complexity to this project. The installer’s primary business (defined as a minimum of 60% of total billings) shall be exterior plant installation.
B. Installer’s Field Supervision: Installer to maintain an experienced full-time supervisor on the project site when exterior planting is in progress.

C. Exterior Plant Materials:
   1. Provide plant materials of quantity, size, genus, species, and variety indicated on the Drawings.
   2. All plant materials and work shall comply with recommendations and requirements of ANSI Z60.1 “American Standard for Nursery Stock.”
   3. Do not make substitutions. If specified landscape material is not obtainable, submit proof of non-availability to Architect, together with proposal for use of equivalent material.
   4. The Architect may inspect plant materials either at place of growth or on site before planting, for compliance with requirements for genus, species, variety, size, and quality. Architect retains right to further inspect trees for size and condition of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees immediately from project site.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials:
   1. Deliver packaged materials in containers showing weight, analysis, and name of manufacturer or grower.
   2. Protect materials from deterioration during delivery, and while stored at site.

B. Exterior Plant Materials
   1. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.
   2. Deliver exterior plant materials after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set plant materials in shade, protect from weather and mechanical damage, and keep roots moist and free from frost.
   3. Do not remove container-grown stock from containers until planting time.
   4. Balled and burlapped material shall be freshly dug.
   5. Handle planting stock by root ball.

1.6 PROJECT CONDITIONS
A. Examine the subgrade, verify the elevations, and observe the conditions under which work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate as required.

C. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

D. Provide all necessary safeguards for the protection of all planted areas until provisional inspection/acceptance is accomplished.

E. Planting Restrictions: Plant during one of the following periods.
   1. Spring Planting: Unfrozen soil conditions March 1-June 1st.
   2. Fall Planting: September 1-November 1st or until frozen soil conditions prevent work.
   3. Summer Planting: June 1 – September 1 with approved irrigation system.

F. Coordination with Lawns: Install plant materials after finish grades are established and before planting lawns, unless otherwise acceptable to the Architect.
   1. When planting exterior plants after lawns, protect lawn areas and promptly repair damage caused by planting operations.

1.7 WARRANTY

A. Warranty exterior plant materials for a period of one year after date of Final Completion against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents which are beyond Contractor’s control.
   1. The Contractor shall provide written notice to the Architect of any practice which will affect the warranty if not remedied promptly. The Architect will render an opinion of the conflict if necessary.
   2. Make replacements of all dead plants or plants in impaired condition (more than 25% dead or dying) condition in early spring/fall following installation. Replacements of dead or rejected plants should again be made prior to the expiration of the warranty period.

1.8 MAINTENANCE

A. The Owner is responsible for maintaining all exterior plant material throughout the warranty period according to the submitted Maintenance Schedule.

B. Remove all stakes and guy wires at the end of the 12 month guarantee period.

PART 2 – PRODUCTS

EXTERIOR PLANTS
2.1 EXTERIOR PLANT MATERIALS

A. General: Provide nursery-grown plant materials complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

B. Label at least one tree and one shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.

2.2 PLANTS

A. Annuals: Provide healthy, disease-free plants of species and variety indicated. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.

B. Perennials: Provide healthy, field-grown plants from a commercial nursery of species and variety shown or listed.

C. Vines: Provide plants with heavy, well-branched tops, with not less than three runners and a vigorous well-developed root system.

2.3 FERTILIZER

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium. Revise fertilizer mix to remedy deficiencies found in soil.

1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium. Revise fertilizer mix to remedy deficiencies found in soil.

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.4 MULCHES

1. Organic Mulch: Six (6) month old well rotted double shredded native hardwood bark mulch not larger than 4" in length and 1/2" in width, free of woodchips and sawdust.
2.5 WATER
   1. Free of substances harmful to plant growth.

2.6 TOPSOIL
   A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content. Topsoil shall be fertile, friable, natural topsoil of loamy character, without admixture of subsoil material, obtained from a well-drained arable site, reasonably free from clay, lumps, coarse sands, stones, plants, roots, sticks and other foreign materials.
   B. Topsoil Source:
      1. Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
         a) Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.
      2. Import topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.
      3. Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
         a) Surface soil may be supplemented with imported or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

2.7 INORGANIC SOIL AMENDMENTS
   A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
      1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.
      2. Class: Class O, with a minimum 95 percent passing through No. 8 (2.36-mm) sieve and a minimum 55 percent passing through No. 60 (0.25-mm) sieve.
      3. Provide lime in form of dolomitic limestone.
   B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 (3.35-mm) sieve and a maximum 10 percent passing through No. 40 (0.425-mm) sieve.
   C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
D. Aluminum Sulfate: Commercial grade, unadulterated.
E. Perlite: Horticultural perlite, soil amendment grade.
F. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.
G. Sand: Clean, washed, natural or manufactured, free of toxic materials.
H. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.8 ORGANIC SOIL AMENDMENTS
A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch (19-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
   1. Organic Matter Content: 50 to 60 percent of dry weight.
   2. Feedstock: Agricultural, food, or industrial residuals; bio-solids; yard trimmings; or source-separated or compostable mixed solid waste.
B. Sphagnum peat moss: Sphagnum peat moss shall be partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.
C. Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.
D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
   1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with at least 0.15 lb (2.4 kg) of ammonium nitrate or 0.25 lb (4 kg) of ammonium sulfate per cubic foot (cubic meter) of loose sawdust or ground bark.
E. Manure: Well-rotted, unleached, poultry, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.9 MISCELLANEOUS PRODUCTS
A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer’s written instructions.

PART 3 – EXECUTION

EXTERIOR PLANTS 329300 - 6
3.1 EXAMINATION

A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Tree save areas as indicated shall be tagged and approved by the Architect prior to any clearing and/or thinning.

B. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

D. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before planting. Make minor adjustments as required.

E. Lay out exterior plants at locations indicated. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

F. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

3.3 PLANTING BED ESTABLISHMENT

A. Loosen subgrade of planting beds to a minimum depth of 4 inches (100 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off of Owner's property.

1. Apply fertilizer directly to subgrade before loosening.

2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.

   a) Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

   b) Mix lime with dry soil before mixing fertilizer.

B. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

C. Restore planting beds if eroded or otherwise disturbed after finish grading and before planting.
3.4 TREE AND SHRUB PLANTING

A. Set all plant materials plumb and in center of pit or trench as per detail.
   1. Remove burlap and wire baskets from tops of root balls and partially from sides, but
do not remove from under root balls. Remove pallets, if any, before setting. Do
not use planting stock if root ball is cracked or broken before or during planting
operation.

   2. Carefully remove root ball from container without damaging root ball or plant.

   3. Place planting soil mix around root ball in layers, tamping to settle mix and
   eliminate voids and air pockets. When pit is approximately one-half backfilled,
   water thoroughly before placing remainder of backfill. Repeat watering until no
   more water is absorbed. Water again after placing and tamping final layer of
   planting soil mix.

   4. Spread roots without tangling or turning toward surface, and carefully work backfill
   around roots by hand. Puddle with water until backfill layers are completely
   saturated. Plumb before backfilling and maintain plumb while working backfill
   around roots and placing layers above roots. Tamp final layer of backfill. Remove
   injured roots by cutting cleanly, do not break.

   5. Dish top of backfill to allow for mulching.

B. Organic Mulching: Apply 3-inch (75-mm.) average thickness of organic mulch
   extending 12 inches (300 mm) beyond edge of planting pit or trench. Do not place
   mulch within 3 inches (75 mm) of trunks or stems.

3.5 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees and shrubs as indicated.

3.6 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants as indicated in details.

   B. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

3.7 CLEANUP AND PROTECTION

A. During exterior planting, keep adjacent pavings and construction clean and work
area in an orderly condition.

   B. Protect exterior plants from damage due to landscape operations, operations by
other contractors and trades, and others. Maintain protection during installation and
maintenance periods. Treat, repair, or replace damaged exterior planting.

3.8 DISPOSAL

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable
soil, trash, and debris, and legally dispose of them off Owner's property.
END OF SECTION 329300
SECTION 331000 - EXTERIOR WATER SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY
   A. This section includes water service piping, fire protection service mains and appurtenances from the source of water to a point 5 feet outside the building.

1.3 SUBMITTALS
   A. Product data for piping, valves, vaults, fire hydrants, and identification devices.

1.4 QUALITY ASSURANCE
   A. Comply with local utility department and fire department standards pertaining to materials, meter boxes, hose threads and installation.
   B. Comply with the requirements of the latest edition of the City of Colonial Heights Utility Standards.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Preparation for Transport: Prepare valves, including fire hydrants, for shipping as follows:
      1. Ensure valves are dry and internally protected against rust and corrosion.
      2. Protect valves against damage to threaded ends, flange faces, and weld ends.
      3. Set valves in best position for handling. Set gate valves and fire hydrants closed to prevent rattling.
   B. Storage: Use the following precautions for valves, including fire hydrants, during storage:
      1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
      2. Protect valves from weather. Store valves indoors. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is necessary, support valves off the ground or pavement in watertight enclosures.
C. Handling: Use a sling to handle valves, including fire hydrants, whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.6 PROJECT CONDITIONS

A. Site Information: Perform site surveys, research public utility records, and verify existing utility locations. Verify that exterior water system may be installed in compliance with the original design and referenced standards. Notify Architect immediately of any discrepancies.

B. Coordinate connection to the existing water service with

1.7 SEQUENCING AND SCHEDULING

A. Coordinate with interior water piping and interior fire protection piping.

B. Coordinate with other utility work.

C. Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions:
   1. Notify Architect not less than two days in advance of the proposed interruption.
   2. Do not proceed with the interruption without Architects written permission.
   3. Provide temporary utility service to the facility.

PART 2 - PRODUCTS

2.1 GENERAL

A. All piping, valves, fittings, fire hydrants, meters, meter vaults, appurtenances and other products shall conform to the requirements of the latest edition of the City of Colonial Heights Utility Standards.
3.1 GENERAL
   A. Installation of the exterior water system shall comply with the requirements of the latest edition of the City of Colonial Heights Utility Standards.

3.2 PREPARATION OF BURIED PIPE FOUNDATION
   A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation throughout the length of the pipe.
   B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill with clean sand or pea gravel to indicated level.
   C. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.3 PIPE AND PIPE FITTINGS INSTALLATION
   A. Depth of Cover: Provide minimum cover over piping of 18 inches below average local frost depth or 42 inches below finished grade, whichever is greater.
   B. Water Service Termination: Terminate water service piping 5'-0" from building foundation in location and invert as indicated. Coordinate location with interior water piping and interior fire service piping. Provide temporary pipe plug for piping extension into building.

3.4 IDENTIFICATION INSTALLATION
   A. Install underground warning tape and tracing wire for underground water service piping, as required by the latest edition of the City of Colonial Heights Utility Standards.

3.5 FIELD QUALITY CONTROL
   A. Testing and Disinfection: Disinfect, flush and test in accordance with the requirements of the latest edition of the City of Colonial Heights Utility Standards.

END OF SECTION 331000
SECTION 333000 - SANITARY SEWERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY
   A. This Section includes sanitary sewerage system piping and appurtenances from a point 5 feet outside the building to the point of disposal.

1.3 SUBMITTALS
   A. Product data for sewer piping specialties.
   B. Shop drawings for precast concrete sanitary manholes, including frames and covers.
   C. Shop drawings for cast-in-place concrete or field-erected masonry sanitary manholes, including frames and covers.
   D. Inspection and test reports specified in the "Field Quality Control" Article

1.4 QUALITY ASSURANCE
   A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to sanitary sewerage systems, and to the requirements of the Virginia Erosion and Sediment Control Handbook for erosion control during installation.
   B. Utility Compliance: Comply with the requirements of the latest edition of the City of Colonial Heights Utility Standards.

1.5 DELIVERY, STORAGE, AND HANDLING
   1. Do not store plastic structures in direct sunlight.
   2. Do not store plastic pipe or fittings in direct sunlight.
   3. Protect pipe, pipe fittings, and seals from dirt and damage.
   4. Handle precast concrete manholes and other structures according to manufacturer's rigging instructions.
1.6 PROJECT CONDITIONS
   A. Site Information: Perform site surveys, research public utility records, and verify existing utility locations. Verify that sanitary sewerage system piping may be installed in compliance with original design and referenced standards.
   B. Locate existing structures and piping to be closed and abandoned.
   C. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted under the following conditions and then only after arranging to provide acceptable temporary utility services.
      1. Notify Architect not less than 48 hours in advance of proposed utility interruptions.
      2. Do not proceed with utility interruptions without receiving Architect's written permission.

1.7 SEQUENCING AND SCHEDULING
   A. Coordinate with interior building sanitary drainage piping.
   B. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS
   A. General: Provide pipe and pipe fitting materials compatible with each other. All materials shall comply with the requirements of the latest edition of the City of Colonial Heights Utility Standards.
   B. PVC (Polyvinyl Chloride) Sewer Pipe and Fittings: ASTM D 3034, SDR 35, elastomeric gasket joints.
   C. Ductile-Iron Pipe: AWWA C151, Class 50 minimum, for push-on joints.
      2. Compact-Pattern, Ductile-Iron Fittings: AWWA C153, for push-on joints.
      3. Pipe and Fitting Interior Coating: AWWA C104, asphaltic-material seal coat, minimum 1-mil (0.025-mm) thickness.
2.2 MANHOLES
   A. Precast Concrete Manholes: Shall comply with the latest edition of the City of Colonial Heights Utility Standards.
   B. Manhole Steps shall comply with the latest edition of the City of Colonial Heights Utility Standards.
   C. Manhole Frames and Covers: Shall comply with the latest edition of the City of Colonial Heights Utility Standards.

2.3 CLEANOUTS
   A. General: Provide cast-iron ferrule and countersunk brass cleanout plug, with round cast-iron access frame and heavy-duty, secured, scoriated cast-iron cover.
   B. Sewer pipe fitting and riser to cleanout: 4” dia. ductile iron pipe.

PART 3 - EXECUTION

3.1 PREPARATION OF FOUNDATION FOR BURIED SANITARY SEWERAGE SYSTEMS
   A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.
   B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill with clean sand or pea gravel to indicated level.
   C. Install pipe bedding as required by the latest edition of the City of Colonial Heights Utility Standards.

3.2 PIPE INSTALLATION
   A. Install the sanitary sewerage system in accordance with the requirements of the latest edition of the City of Colonial Heights Utility Standards.
   B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer’s recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
   C. Use manholes for changes in direction, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.
   D. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.
E. Install piping pitched down in direction of flow, at minimum slope of 2 percent, except where indicated otherwise.

F. Extend sanitary sewerage system piping to connect to building sanitary drains, of sizes and in locations indicated.

3.3 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. Join and install PVC pipe as follows:
   1. Pipe and gasketed fittings, joining with elastomeric seals, in accordance with ASTM D 3212.
   2. Installation in accordance with ASTM D 2321.

B. Join different types of pipe with standard manufactured couplings and fittings intended for that purpose.

3.4 MANHOLES

A. Install precast concrete manholes in accordance with the latest edition of the City of Colonial Heights Utility Standards.

B. Provide rubber joint gasket complying with ASTM C 443 at joints of sections.

C. Apply bituminous mastic coating at joints of sections.

3.5 CLEANOUTS

A. Provide cleanouts as indicated, and as required by authorities having jurisdiction. Set cleanout frame and cover in concrete block 12 by 12 by 6 inches deep, except where location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grades or flush with grade when installed in paving.

3.6 FIELD QUALITY CONTROL

A. Cleaning:  Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
   1. In large, accessible piping, brushes and brooms may be used for cleaning.
   2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
   3. Flush piping between manholes, if required by local authority, to remove collected debris.

B. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.
1. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.

2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects correct such defects, and reinspect.

C. 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 the requirements of the City of Colonial Heights Utility Standards.
   3. Schedule tests, and their inspections by authorities having jurisdiction, with at least 24 hours’ advance notice.
   4. Submit separate reports for each test.

END OF SECTION 333000
SECTION 334100 - STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:
   A. The provisions of the Contract Documents apply to the work of this Section.

1.2 SUMMARY:
   A. This Section includes the roof drainage collection system, the storm sewerage system piping and appurtenances from a point 5 feet outside the building to the point of disposal, and the outfall structures of the stormwater management basin.

1.3 SUBMITTALS
   A. Product data for:
      1. Concrete pipe
      2. Polyethylene pipe
      3. Ductile iron pipe
      4. Frames and covers.
      5. Grates
      6. Couplings for connection into concrete pipe.
   B. Certification, signed by material producer and contractor, that standard precast and cast in place concrete storm drainage manholes and Drop Inlets comply with VDOT standards and specifications.
   C. VDOT approved job mix for bedding stone.
   D. Shop drawings for:
      1. Non-standard precast or cast-in-place concrete storm drainage manholes and Drop Inlets.
      2. Trench drain system.
      3. Cleanouts
      4. Underdrains
      5. Stormwater Management Basin Outlet structures, including: Riser pipe, outfall pipe, riser anchoring, anti-seep collars, trash rack and anti-vortex device.
   E. Record drawings of installed storm drainage system.

1.4 QUALITY ASSURANCE
A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to storm sewerage systems.

B. Utility Compliance: Comply with state and local regulations and standards pertaining to storm sewerage systems.

C. All materials shall be new and free of defects (i.e. pipe shall not have chipped spigots or bells).

1.5 PROJECT CONDITIONS

A. Site Information: Perform site surveys, research public utility records, and verify existing utility locations. Verify that storm sewerage system piping may be installed in compliance with original design and referenced standards.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt existing storm sewer serving facilities occupied by the Owner of others except when permitted under the following conditions and then only after arranging to provide acceptable temporary storm sewer services.
   1. Notify Architect not less than 48 hours in advance of proposed storm sewer interruptions.
   2. Do not proceed with storm sewer interruptions without receiving Architect’s written permission.

D. Existing utilities across or along the line of work are indicated only in an approximate location. Locate all underground lines and structures. Call “Miss Utility” at 1-800-552-7001 prior to construction. If utilities are marked that are not shown on the plans, locate utility vertically and horizontally and provide information to architect.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate with interior building storm drainage piping.

B. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials used for construction of the storm sewerage system shall comply with the requirements of the latest edition of the Virginia Department of Transportation Road and Bridge Standards and Road and Bridge Specifications.
A. Provide pipe and pipe fitting materials compatible with each other. Pipe materials are indicated on the drawings.

B. Reinforced Concrete Pipe (RCP): Shall conform to the requirements of ASTM C76/AASHTO M170, Class III, unless otherwise indicated. All RCP shall be gasketed.

C. O-Ring Gasket Reinforced Concrete Pipe: Shall conform to the requirements of ASTM C76/AASHTO M170, Class III, unless otherwise indicated. Joints shall conform to the requirements of ASTM C443/AASHTO M198.

D. Corrugated Polyethylene Pipe (P.E.): Shall have a smooth lined interior and meet the requirements of ASTM F405 or AASHTO M252 for 10" diameter and smaller, and ASTM F667 or AASHTO M294 for 12" diameter and larger.

E. PVC Storm Sewer Pipe: Shall conform to the requirements of ASTM D3034, SDR-35 with bell and spigot ends for gasketed joints with ASTM F 477 elastometric seals
   a) Connections to the building downspouts shall be made with Schedule 40 PVC, with bell and spigot ends for gasketed joints with ASTM F 477 elastometric seals.

F. Ductile Iron Storm Sewer Pipe: Shall conform to the requirements of AWWA C151, Class 52. Flanged joints shall conform to the requirements of AWWA C115.

2.3 MANHOLES

A. Precast Concrete Manholes: Comply with the requirements of the latest edition of the Virginia Department of Transportation’s Road and Bridge Standards, and Road and Bridge Specifications.

B. Cast-in-Place Manholes: Comply with the requirements of the latest edition of the Virginia Department of Transportation’s Road and Bridge Standards, and Road and Bridge Specifications.

C. Manhole Steps, Safety Slabs and Inlet Shaping: Comply with the requirements of the latest edition of the Virginia Department of Transportation’s Road and Bridge Standards, and Road and Bridge Specifications.

D. Manhole Frames and Covers: Comply with the requirements of the latest edition of the Virginia Department of Transportation’s Road and Bridge Standards, and Road and Bridge Specifications.

2.4 CLEANOUTS

A. Cast-iron ferrule and countersunk brass cleanout plug, with round cast-iron access frame and heavy-duty, secured, scoriated cast-iron cover.
2.5 DROP INLETS
   A. Precast Concrete Drop Inlets: Comply with the requirements of the latest edition of the Virginia Department of Transportation’s Road and Bridge Standards, and Road and Bridge Specifications.
   B. Cast-in-Place Drop Inlets: Comply with the requirements of the latest edition of the Virginia Department of Transportation’s Road and Bridge Standards, and Road and Bridge Specifications.
   C. Drop Inlet Steps, Safety Slabs and Inlet Shaping: Comply with the requirements of the latest edition of the Virginia Department of Transportation’s Road and Bridge Standards, and Road and Bridge Specifications.
   D. Drop Inlet Frames and Grates: Comply with the requirements of the latest edition of the Virginia Department of Transportation’s Road and Bridge Standards, and Road and Bridge Specifications.
   E. Plastic Drain Basins: ADS or approved equal.

2.6 TRENCH DRAIN SYSTEM
   A. Trench drainage system shall be manufactured by NDS, or approved equal.
   B. Trench drain grates shall be galvanized steel, heelproof grates and shall be reinforced to support heavy duty (H20) loads, unless otherwise indicated on the plans.
   C. Provide all fittings and miscellaneous connections necessary for a complete the trench drainage system per the manufacturer requirements.

2.7 CONCRETE AND REINFORCEMENT
   A. Concrete: Conform to the requirements of VDOT Standard Class A3 concrete.
   B. Reinforcement: Steel conforming to the following:
      2. Reinforcement Bars: ASTM A 615, Grade 60, deformed.

2.8 UNDERDRAINS
   A. Underdrains and combination underdrains: Conform to the requirements of the latest edition of the VDOT Road and Bridge Specifications and the VDOT Road and Bridge Standards for the type of underdrain, unless otherwise indicated.
      1. PVC underdrains shall conform to the requirements of ASTM F758, Type PS 28 or ASTM F949.
      2. PE corrugated underdrain pipe shall conform to AASHTO M252.
   B. Provide a filter fabric “sock” wrapping for all underdrain pipe.
2.9 END WALLS AND END SECTIONS

A. End walls: Conform to the requirements of the latest edition of the VDOT Road and Bridge Specifications and the VDOT Road and Bridge Standards.

B. End sections: Conform to the requirements of the latest edition of the VDOT Road and Bridge Specifications and the VDOT Road and Bridge Standards for the size of pipe indicated.

PART 3 - EXECUTION

3.1 GENERAL

A. Install the storm sewerage system in accordance with the latest edition of the Virginia Department of Transportation's Road and Bridge Standards and Road and Bridge Specifications.

3.2 PREPARATION OF FOUNDATION FOR BURIED STORM SEWERAGE SYSTEMS

A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill with clean sand or pea gravel to indicated level.

C. Install pipe bedding conforming to the requirements of the latest edition of the Virginia Department of Transportation's Road and Bridge Standards and Road and Bridge Specifications.

3.3 PIPE INSTALLATION

A. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer’s recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

B. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.

C. Extend storm sewerage system piping to connect to building storm drains, of sizes and in locations indicated.

D. Join and install concrete pipe and fittings per VDOT specifications.

E. Join and install PE pipe and fittings per manufacturer’s recommendations.
F. Join different types of pipe with standard manufactured couplings and fittings intended for that purpose.

3.4 MANHOLES
A. General: Install manholes complete with accessories as indicated. Form continuous concrete or split pipe section channel and benches between inlets and outlet. Set tops of frames and covers flush with finish grade, unless otherwise indicated.
B. Place precast concrete manhole sections as indicated, and install in accordance with ASTM C 891.
C. Construct cast-in-place manholes as indicated.
D. Apply bituminous mastic coating at joints of sections.

3.5 CLEANOUTS
A. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated. Set cleanout frame and cover in concrete block 12 by 12 by 6 inches deep or as indicated on the plans, except where location is in concrete paving. Set top of cleanout flush with finish grade.

3.6 DROP INLETS
A. Construct drop inlets to sizes and shapes indicated.
B. Set frames and grates to elevations indicated.

3.7 INLET SHAPING
A. Construct inlet shaping conforming to VDOT Standard IS-1 at all drop inlets and manholes.

3.8 TRENCH DRAIN INSTALLATION
A. Installation of the trench drain shall comply with the manufacturers recommendations.
B. Verify connection to the storm sewer system. Utilize manufacturers standard outlet connections to make connection to the storm sewer system.
C. Install trench drain system starting from the downstream end, working towards the upstream end.
D. Verify proper placement and alignment prior to placement of concrete.
E. Place concrete around suspended trench channel. Do not chute concrete directly against channel walls, as this may cause displacement. Work concrete under channels and vibrate with a finger-type vibrator.

F. Finish surface to be flush with the adjoining surfaces and to allow for positive drainage into the grates.

G. Install grate tops.

3.9 FIELD QUALITY CONTROL

A. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
   1. In large, accessible piping, brushes and brooms may be used for cleaning.
   2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
   3. Flush piping between manholes and drop inlets to remove collected debris. Flush pipes through an approved erosion and sediment control measure.

B. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.
   1. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
   2. If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects correct such defects and reinspect.

END OF SECTION 334100