SMALL CONSTRUCTION & RENOVATION
DESIGN-BID-BUILD
PROJECT MANUAL

Version 10/22/2025

FOR

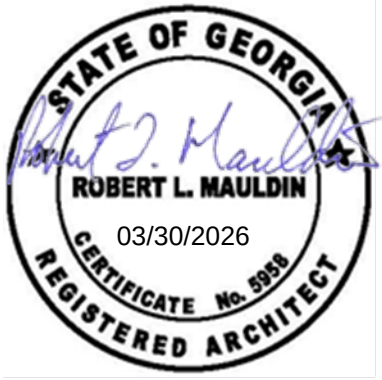
GEORGIA DEPARTMENT OF VETERANS SERVICE
(OWNER)

FOR

PROJECT NO. VSB-151-26-01; FAI NO. GA-21-07
GEORGIA VETERANS MEMORIAL CEMETERY AUGUSTA
3780 Byrd Road, Augusta, GA 30906

2KM Architects, Inc.
529 Greene Street
Augusta, GA 30901

2KM#25-05.08
06/23/2026
For Construction Set



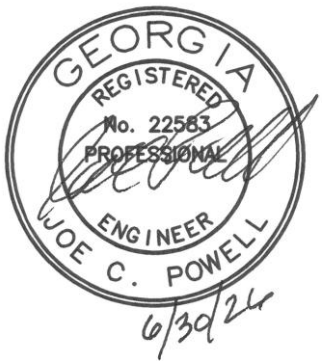
BIDDING MANAGER:
GEORGIA STATE FINANCING AND INVESTMENT COMMISSION
270 Washington Street, Second Floor
Atlanta, Georgia 30334

GVMC AUGUSTA
DEPARTMENT OF VETERANS SERVICE
PROJECT NO. VBS-151-26-01; FAI NO. GA-21-07

CONSULTANTS

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06.23.26

PLUMBING/HVAC

ELECTRICAL DESIGN CONSULTANTS, INC.
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(706) 724-3551



06•23•26

ELECTRICAL

GVMC AUGUSTA
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PROJECT NO. VBS-151-26-01; FAI NO. GA-21-07

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STRUCTURAL

DESIGN-BID-BUILD PROJECT MANUAL

GVMC AUGUSTA
PROJECT NO. VSB-151-26-01; FAI NO. GA-21-07

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BID REQUIREMENTS:

INSTRUCTIONS TO BIDDERS

1. **Bidding Documents.** The Bidding Documents include the Bid Requirements, Specifications, Drawings, and all Addenda.

2. **Bids Shall Comply with Georgia Law**. All bids submitted in response to this Invitation to Bid shall be made in general accordance with the applicable provisions of Georgia Law and the provisions of the DOAS Georgia Procurement Manual that are applicable to Public Works Construction Contracts.

3. **Bid Submission**. All bids must be submitted electronically through e-Builder by the time stated in the Invitation to Bid. The Bid Verification and Statement of Qualifications, Bid Bond, E-Verify Affidavit and any other forms required to be submitted at the time of bid shall be uploaded through e-Builder. All blanks on the Bid Verification and Statement of Qualification Form must be completed. Failure to complete entries in all blanks in the Bid Verification and Statement of Qualification Form, or any other required form may be considered sufficient cause for rejection of a bid. The inclusion of any condition, alternate, qualification, limitation, or provision not called for may render the bid non-responsive and may be sufficient cause for rejection of a bid.

4. **Alternates**. Bids must include prices for all specified alternates, if any. If a price is not provided for all alternates, the bid may be determined non-responsive and not considered for award. Unless otherwise stipulated, all alternates are deductive. Any alternate or alternates, if taken, will be taken in numerical sequence, starting with Alternate #1, to the extent necessary.

5. **Bid Bond Required**. Each bid must be accompanied with a BID BOND in an amount equal to 5% of the base bid, payable to Owner, in order to guarantee that the successful bidder will enter into the Contract, substantially in accordance with the Contract shown in the Bidding Documents, to construct the project strictly in compliance with the Bidding Documents and Contract. Bid Bonds should be furnished on forms accepted as standard by the insurance industry.

6. **Withdrawal of Bids.** Bids may be withdrawn by bidders prior to the time set for official opening. After bids have been opened, no bid may be withdrawn for a period of sixty (60) days after the time and date of opening, except as provided in O.C.G.A. § 13-10-22 (appreciable error in calculation of bid). Negligence or error on the part of any bidder in preparing its bid confers no right of withdrawal or modification of the bid after bid opening, except as otherwise provided by Georgia law.

7. **Owner's Right to Reject Bids.** Owner reserves the right to reject any or all bids and to waive technicalities and irregularities. Owner further reserves the right, in its sole and complete discretion, to reject any bid that is over budget and to reject any bid from a bidder that is not responsible. In judging whether the bidder is responsible, Owner will consider, but is not limited to consideration of, the following:

   (a) Whether the bidder or its principals are currently ineligible, debarred, suspended, or otherwise excluded from bidding or contracting by any local, state, or federal agency, department, or authority;
   (b) Whether the bidder or its principals have been terminated for cause or are currently in default on any contract;
   (c) Whether the bidder can demonstrate a commitment to safety with regard to Workers' Compensation by having an Experience Modification Rate (EMR) over the past three years not exceeded an average of 1.2; and
   (d) Whether the bidder's past work provides evidence of an ability to successfully complete public works projects within the established time, quality, or cost, and to comply with the bidder's contract obligations.

8. **Owner's Right to Negotiate with the Lowest Bidder.** In the event all responsive and responsible bids are in excess of the budget, Owner, in its sole and absolute discretion and in addition to the rights set forth above, reserves the right to negotiate with the lowest responsive and responsible bidder (after taking all deductive alternates) only for the purpose of making changes to the Project that will result in a cost to Owner that is within the budget, as it may be amended.

9. **Bid Preparation Expenses**. All expenses for preparing and submitting bids are the sole cost of the party submitting the bid. Owner is not obligated to any party to reimburse such expenses. All bids, upon receipt, become the property of Owner.

10. **Open Records Act.** As required by the Open Records Act, the details of the bids will remain confidential until final award. Labeling information provided in submittals as "proprietary" or "confidential," or any other designation of restricted use will not protect the information from public view unless it is otherwise not subject to disclosure under the Open Records Act. Bidders shall be solely responsible for taking all steps necessary to ensure such documents are exempted from disclosure by law.

11. **Award**. The Contract will be awarded, if at all, on a lump sum basis to the lowest responsible, responsive bidder. The lowest bid will be the bid, whose price, after incorporating all accepted alternates, is the lowest responsive bid which was received from a responsible bidder.

12. **Contract Forms and Bonds**. The Contract, if awarded, will be substantially in accordance with the Contract shown in the Bidding Documents. If the Contract is awarded, the successful bidder shall be required to execute the Contract and return it to Owner within ten (10) business days. The successful bidder shall also be required to furnish payment and performance bonds, both in amounts equal to 100% of the Contract Sum along with the executed Contract.

13. **Failure to Execute Contract**. If the successful bidder fails to execute the Contract within ten (10) business days after notice of such acceptance or if the bidder fails to furnish performance and payment bonds, the obligation of the bid bond, if applicable, will remain in full force and effect and the money payable thereon shall be paid into the funds of Owner.

14. **Surety and Insurance Companies**. The Contract provides that the surety and insurance companies must be acceptable to Owner. Only those sureties listed in the Department of Treasury's Listing of Approved Sureties (Department Circular 570) are acceptable to Owner. At the time of issuance, all insurance policies and bonds must be issued by a company licensed by the Georgia Insurance Commissioner to transact the business of insurance in the State of Georgia for the applicable line of insurance. Such company shall be an insurer with an A.M. Best Financial Strength Rating of "A-" or better and with an A.M. Best Financial Size Category of Class V or larger.

15. **Interpretations**. No oral interpretations will be made to bidders as to the requirements of the Bidding Documents. Requests for interpretation of the Bidding Documents shall be made in writing not later than **six (6)** business days prior to the date set for receipt of bids. All interpretations made to the bidders will be issued in the form of addenda to the Bidding Documents and will be posted to the e-Builder web site. Such addenda are to be acknowledged at the appropriate location on the electronic Bid Form. No addenda will be issued within three (3) business days of the date set for receipt of bids without an extension of the bid date.

16. **Trade Names.**

a. *No Restriction of Competition.* When reference is made in the Bidding Documents to trade names, brand names, or to the names of manufacturers, such references are made solely to indicate that products of that description may be furnished and are not intended to restrict competitive bidding. If it is desired to use products of trade or brand names or of manufacturers' names which are different from those mentioned in the Bidding Documents, application for the approval of the use of such products

must be received by the Design Professional and the Contracting Officer at least ten (10) business days prior to the date set for the opening of bids.

b. *Request for Approval of Substitute Product*. All requests for approval of substitution of a product must be made to the Design Professional in writing. The request shall include a copy of the published recommendations of the manufacturer for the installation of the product, together with a complete schedule of changes in the Drawings and Specifications, if any, that must be made in other work in order to permit the use and installation of the proposed product in accordance with the recommendations of the manufacturer of the product. The application must be accompanied by a schedule setting forth in which respects the materials or equipment submitted for consideration differ from the materials or equipment designated in the Bidding Documents. To be approved, a proposed product must also meet or exceed all express requirements of the Bidding Documents.

c. *Issuance of Addenda*. If the submittal is approved by the Design Professional, an addendum will be issued to all prospective bidders. The successful bidder may furnish no products of any trade names, brand names, or manufacturers' names except those designated in the Bidding Documents or any addenda.

d. *Conference with Owner*. Any party who alleges that rejection of a submittal is the result of bias, prejudice, caprice, or error on the part of the Design Professional may request a conference with a representative of Owner; PROVIDED that the request for said conference, submitted in writing, is received by Owner at least five business days prior to the date set for the opening of bids, time being of the essence.

17. Sales Tax. Unless otherwise provided in the Bidding Documents, the successful bidder shall pay all sales, consumer, use and other similar taxes, which are legally enacted at the time bids are received.

18. Examination of Site. In submitting a bid for the Project, the bidder acknowledges that it has visited the Project Site and has taken into consideration all observed conditions that might affect its work.

19. Employment of Georgia Citizens and Use of Georgia Products. It is the desire of Owner that materials and equipment manufactured or produced in Georgia shall be used in the work and that Georgia citizens shall be employed in the work at wages consistent with those being paid in the general area in which the work is to be performed. This desire on the part of Owner is not intended to restrict or limit competitive bidding or to increase the cost of the work; nor shall the fulfillment of this desire be asserted by the successful bidder as an excuse for any noncompliance or omission to fulfill any obligation under the Contract.

20. Trading with the State, Ethics. By submitting a bid, the bidder certifies that the provisions of law contained in O.C.G.A. §§ 45-10-20 to 45-10-71, which prohibit officials and employees of the State from engaging in certain transactions with the State and State agencies, and the Governor's Executive Orders governing ethics, have not and will not be violated in any respect in regard to this Contract.

21. Reciprocal Preference Law. In accordance with O.C.G.A. § 13-10-3, vendors resident in the State of Georgia will be granted the same preference over vendors resident in another State in the same manner, on the same basis, and to the same extent that preference is granted in awarding bids for the same goods or services by such other State to vendors resident therein over vendors resident in the State of Georgia. A Georgia resident business shall include any business that regularly maintains a place from which business is physically conducted in Georgia for at least one year prior to submitting this bid or a new business that is domiciled in Georgia which regularly maintains a place from which business is physically conducted in Georgia; provided, however, that a place of business shall not include a post office box, site trailer, or temporary structure.

22. Experience Requirement Limitations. No bidder will be disqualified from a bid based upon its lack of previous experience if prohibited by O.C.G.A. § 13-10-4.

23. Georgia Security and Immigration Compliance Act. All bids shall include a Contractor Affidavit required under O.C.G.A § 13-10-91(b)(1), a form of which is attached hereto ("E-Verify Affidavit"). Failure to submit this form with submission of a bid will result in the rejection of the bid.

BID REQUIREMENTS:

BID VERIFICATION AND STATEMENT OF QUALIFICATIONS
(To be subscribed and sworn to before a notary public)

Under oath, the undersigned submits the following bid verification and statement of qualifications for consideration by Owner:

Firm Name: _____
LEGAL NAME OF BUSINESS (As registered with Secretary of State)

Address: _____
LEGAL BUSINESS ADDRESS (P.O. BOX IS INSUFFICIENT)

_____
CITY STATE ZIP

_____
MAILING ADDRESS IF DIFFERENT FROM ABOVE

Telephone Number: _____ Facsimile Number: _____

Contact Person Name:_____ Contact's Email Address: _____

Year Organized: _____ Where Incorporated: _____

Is Firm a Georgia Resident: ☐YES ☐NO

Form of Organization: ☐ Proprietorship ☐ Corporation ☐ Partnership ☐ LLC

Federal I.D. No.: _____ or Social Security No.: _____

The firm's principals are as follows:

(1) _____
Check One: ☐ President ☐ Partner ☐ Owner

(2) _____
Check One: ☐ Vice President ☐ Secretary ☐ Partner

(If incorporated, the names of both the President and Corporate Secretary must be indicated. If a partnership, all partners must be indicated.)

Number of years engaged in the contracting business under the firm's current name: _____

Georgia General Contractor: ☐YES ☐NO License Number(s): _____

Other State General Contractor Licenses, Trade or Specialty Licenses:

- Type:_____ License Number:_____

  Issuing State or Issuing Authority:_____
- Type:_____ License Number: _____

Issuing State or Issuing Authority: _____

Has the bidder refused to execute a contract upon award? ☐YES ☐NO

Has the bidder been declared in default on a contract? ☐YES ☐NO

Has the bidder ever been terminated for cause on a contract? ☐YES ☐NO

Has the bidder, its principals, or officers been convicted of building code violations, bribery, bid rigging, or any other felony involving moral turpitude? ☐YES ☐NO

Is the bidder or its principals or officers currently debarred, suspended, or declared ineligible or otherwise excluded from contracting with the Federal government or any state or local governmental entity? ☐ YES ☐NO

Is the bidder's current Experience Modification Rate (EMR) greater than 1.2? ☐YES ☐NO

If answer is "Yes" to any statement above, please explain (attach additional sheets if necessary):
_____
_____
_____
_____

1. **Bid Certification.** Having carefully examined the Bidding Documents titled Georgia Veterans Memorial Cemetery Augusta, dated 06/23/2026, and any Addenda, as well as the premises and conditions affecting the Work, the undersigned certifies its bid, submitted via e-Builder, to furnish all services, labor, and materials called for by said Bidding Documents.

2. **Bid Bond.** Enclosed herewith is a bid bond in the amount of

   _____DOLLARS ($_____) (being not less than 5% of the base bid) payable to GA Department of Veterans Service. The undersigned hereby agrees that this bid may not be revoked or withdrawn after the time set for the opening of bids, but shall remain open for acceptance for a period of 60 days following such time.

3. **Certification of Proper Licenses.** Bidder certifies that it has been granted and possess all necessary, valid, and current licenses to do business in the State of Georgia as issued by the respective State Boards and Government Agencies responsible for regulating and licensing the services to be provided and performed pursuant to this Agreement.

4. **Certification of No Fraud or Collusion.** I certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, or person submitting a bid for the same materials, supplies, or equipment, and is in all respects fair and without collusion or fraud. I understand collusive bidding is a violation of State and Federal law and can result in fines, prison sentences, and civil damage awards. I agree to abide by all conditions of this bid and certify that provisions of O.C.G.A. § 45-10-20 *et seq*. have not and will not be violated in any respect.

Under oath I certify that I am a principal or other representative of the bidder and that I am authorized by it to execute this Bid Verification on its behalf. I am personally knowledgeable of the foregoing statements of fact, which are true and correct.

BY: _____
Authorized Signature (BLUE INK PLEASE)

_____
Typed/Printed Name Title

SUBSCRIBED AND SWORN
BEFORE ME ON THIS THE

_____ DAY OF _____, 20___

_____ [NOTARY SEAL]
Notary Public

My Commission Expires:

NOTICE TO BIDDERS

1) **MAKE SURE YOU HAVE SIGNED THIS BID VERIFICATION AND STATEMENT OF QUALIFICATIONS IN THE SPACE PROVIDED ABOVE.**
2) **MAKE SURE YOU AND YOUR SURETY HAVE PROPERLY EXECUTED THE BID BOND.**
3) **YOU MUST UPLOAD THE FOLLOWING FORMS INTO E-BUILDER WHEN YOUR BID IS SUBMITTED:**

- **BID VERIFICATION AND STATEMENT OF QUALIFICATIONS**
- **BID BOND**
- **CONTRACTOR AFFIDAVIT UNDER O.C.G.A § 13-10-91 (E-VERIFY AFFIDAVIT)**
- **TAX COMPLIANCE FORM**

CONTRACTOR AFFIDAVIT UNDER O.C.G.A. § 13-10-91

The undersigned contractor ("Contractor") executes this Affidavit to comply with O.C.G.A § 13-10-91 related to any contract to which Contractor is a party that is subject to O.C.G.A. § 13-10-91 and hereby verifies its compliance with O.C.G.A. § 13-10-91, attesting as follows:

a) The Contractor has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program;

b) The Contractor will continue to use the federal work authorization program throughout the contract period, including any renewal or extension thereof;

c) The Contractor will notify the public employer in the event the Contractor ceases to utilize the federal work authorization program during the contract period, including renewals or extensions thereof;

d) The Contractor understands that ceasing to utilize the federal work authorization program constitutes a material breach of Contract;

e) The Contractor will contract for the performance of services in satisfaction of such contract only with subcontractors who present an affidavit to the Contractor with the information required by O.C.G.A. § 13-10-91(a), (b), and (c);

f) The Contractor acknowledges and agrees that this Affidavit shall be incorporated into any contract(s) subject to the provisions of O.C.G.A. § 13-10- 91 for the project listed below to which Contractor is a party after the date hereof without further action or consent by Contractor; and

g) Contractor acknowledges its responsibility to submit copies of any affidavits, drivers' licenses, and identification cards required pursuant to O.C.G.A. § 13-10-91 to the public employer within five business days of receipt.

_____ _____

Federal Work Authorization User Identification Number Date of Authorization

_____ GA Veterans Memorial Cemetery, Augusta

Name of Contractor Name of Project

Georgia Department of Veterans Service
Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.

Executed on _____, _____, 20_____ in _____ (city), _____ (state).

_____
Signature of Authorized Officer or Agent

_____
Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF _____, 20_____.

_____
NOTARY PUBLIC
My Commission Expires: _____

TAX COMPLIANCE FORM

INSTRUCTIONS TO SUPPLIERS
Please complete the following information:

- Supplier's Name:
- Physical Location Address:
- Federal Identification Number (FEI):
- Have you ever been registered in the State of Georgia?
- If so, please provide the following information, if applicable:
    - State Taxpayer Identification Number (STI):
    - Sales and Use Tax Number:
    - Withholding Tax Number:
- What type of service will you perform?
- Will you sell any tangible personal property or goods?
- Supplier's Affiliate's Name:
    - FEI:
    - STI:
    - Sales and Use Tax Number:
    - Withholding Tax Number:

  If there is more than one affiliate, please attach a separate sheet listing the information above.
- Person responsible for handling supplier's tax issues (such as the CFO, the company tax officer, etc.):
    - Name:
    - Telephone Number:
    - E-mail Address:

NOTICE TO SUPPLIER:
In the event the supplier is considered for contract award, the information provided in the form will be submitted by the State Entity to the Georgia Department of Revenue ("DOR") for a determination as to whether the supplier is a "prohibited source" (as defined by O.C.G.A. §50-5-82) or whether there are any other outstanding tax issues. MISSING, INCOMPLETE, OR ERRONEOUS DATA MAY DELAY OR PROHIBIT VERIFICATION OF YOUR ELIGIBILITY FOR CONTRACT AWARD. NO PROHIBITED SOURCE MAY RECEIVE CONTRACT AWARD; THEREFORE, YOU ARE STRONGLY ENCOURAGED TO CHECK YOUR TAX STATUS NOW AND RESOLVE ANY OUTSTANDING TAX LIABILITIES AND/OR MISSING TAX RETURNS.

STATE ENTITY: Please submit this form via email to DOR at tsd-state-contractors@dor.ga.gov for processing in accordance with the *Georgia Procurement Manual*.

FORM OF CONTRACT

THIS CONSTRUCTION CONTRACT (hereinafter the "Contract") is made this day of , by and between (Insert Name of Contractor), hereafter "Contractor," and the Georgia Department of Veterans Service, hereafter called "Owner," for the construction of Project No. VSB-151-26-01, Georgia Veterans Memorial Cemetery Augusta (hereinafter the "Project").

Contractor and Owner agree as follows:

1. The Contract and Scope of Work. The Contract includes this Form of Contract, Contract General Requirements, Supplementary Contract Requirements, Exhibits, and all Drawings and Specifications included in the Bidding Documents titled Georgia Veterans Memorial Cemetery Augusta, and all Addenda, each of which are incorporated herein. Contractor shall furnish all the materials and perform all the Work described in the Contract and shall do everything required by or reasonably inferable therefrom.

2. The Contract Sum. Owner shall pay Contractor for the full performance of the Work the Contract Sum as follows:

Dollars ($)

3. Notice. Notice in accordance with Section 1.1.6 of the General Requirements shall be given to the following addresses:

Contractor:	Attention: Phone Number:
OWNER:	GA Department of Veterans Service 2 MLK Jr. Dr. SE, Suite E-970 Atlanta, GA 30334 Attention: Russell Feagin, Executive Director, Health Contracting & Facilities Phone Number: 478-445-2544
DESIGN PROFESSIONAL:	2KM Architects, Inc. 529 Greene Street Augusta, GA 30901 Attention: Robert L. Mauldin Phone Number: 706-736-3333

4. Material Completion. The Material Completion Date is **548 consecutive calendar days.**

5. Liquidated Damages. The agreed amount for Liquidated Damages is **Zero Dollars ($0.00)** per day.

6. **Energy Efficiency and Sustainable Construction Act of 2008.** This project is subject to the Energy Efficiency and Sustainable Construction Act of 2008 ("Energy Act"). Projects subject to the Energy Act require commissioning, water-use reduction, and use of not less than 10% of Georgia products.

7. **No Assignment.** This Contract and the proceeds of this Contract shall not be assigned, nor may the performance hereunder be assigned, without the prior written consent of Owner. Any attempted assignment without such prior written consent shall be void.

8. **Full Performance; No Waiver.** Owner and Contractor hereby agree to the full performance of the Contract. The failure of Owner at any time to require performance by Contractor of any provision will not affect the right of Owner thereafter to enforce such provision or any other provision of the Contract. The failure of Owner to enforce or exercise remedies as a result of any breach of any provision shall not be considered a waiver of such provision, such remedies, any subsequent breach of such provision, or any other provision, or a modification or rescission of the Contract. No provision of this Contract, or right or remedy of Owner, will be deemed waived unless such waiver is in writing and executed by Owner.

9. **Severability.** If any provision of this Contract, or the application thereof to any person or circumstance, is declared invalid or unenforceable to any extent, then the remainder of this Contract, or the application of such provision to persons or circumstances other than those as to which it is held invalid or unenforceable, shall not be affected thereby, and each provision of this Contract shall be valid and enforced to the fullest extent permitted by law.

10. **Full Agreement.** The Contract supersedes all prior negotiations, discussions, statements, and agreements between Owner and Contractor and constitutes the full, complete, and entire agreement between Owner and Contractor. There can be no changes to this Contract by oral means, by course of conduct of the parties, or by custom of the trade. No change to this Contract will be binding on either party unless such change is properly authorized, in writing, and in accordance with the terms of this Contract.

IN WITNESS WHEREOF the parties hereto have executed this Contract under seal on the day and year first written above.

Contractor By:_____ Title:_____	**GEORGIA DEPARTMENT OF VETERANS SERVICE** **Owner** By:_____ Title:_____

CONTRACT GENERAL REQUIREMENTS
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1 GENERAL PROVISIONS

1.1 Miscellaneous Contract Requirements

1.1.1 Administration of Contract. Both the Owner and Design Professional have construction contract administration duties under the Contract. Design Professional is not the agent of Owner, except to the extent so specified in writing. Design Professional has no authority to unilaterally amend the Contract, orally or in writing, either expressly or by implication.

1.1.2 Requirement for Written Amendment. No amendment to this Contract shall be effective unless it is in writing and signed by duly authorized representatives of the parties. No representation, request, instruction, directive or order, made or given by any official of any agency of the State of Georgia, whether verbal or written shall be effective to amend this contract or excuse or modify performance hereunder unless reduced to a formal amendment and executed as set forth above. Contractor shall not be entitled to additional compensation, delay in performance, or other benefit claimed for relying upon or responding to any such representation, request, instruction, directive, or order. Contractor expressly acknowledges the constitutional prohibition of claims (including Claims) against Owner based solely upon oral statement, course of conduct, customs of the trade, quasi-contract, unjust enrichment, quantum meruit, or O.C.G.A. § 13-4-4 (mutual departure from contract terms)

1.1.3 Work Not Subject to Lien. Title to the Site and the Project is vested in the State of Georgia as public property of the State of Georgia and is therefore not subject to levy or lien.

1.1.4 Legal Compliance. This Contract shall be interpreted and governed by the laws of Georgia without regard to principles of conflicts of laws. Contractor shall comply with all laws, rules, regulations, ordinances, and orders of any governmental authority having jurisdiction over the Project or the performance of the Work, and the specific laws noted below, and shall ensure such compliance of its Subcontractors.

1.1.4.1 Open Records Act. Owner and Contractor acknowledge and agree that certain records of the Project and the Work, including records of Subcontractors, are subject to the Georgia Open Records Act, O.C.G.A. § 50-18-70 *et seq.*, with particular attention being called to O.C.G.A. § 50-18-70(a) regarding the records of private persons, firms, corporations, or other private entities engaged in performance of services or functions on behalf of a state agency, public agency, or public office.

1.1.4.2 Energy Efficiency and Sustainable Construction Act of 2008. All projects subject to the Georgia Energy Efficiency and Sustainable Construction Act of 2008 (“Energy Act”) must be designed so that not less than 10 percent of all building materials used in the project are materials that are harvested, extracted, or manufactured in the State of Georgia where such products are commercially available. Contractor shall track the value of all Georgia-based materials installed in the project. Contractor shall provide documentation to ensure compliance with, and shall complete the Georgia-Based Materials and Products Checklist to certify compliance with, the requirements of the Energy Act. A copy of Georgia-Based Materials and Products Checklist is included in the GSFIC Forms Packet.

1.1.4.3 Use of Georgia Materials and Equipment and Georgia Forest Products. Contractor shall use materials and equipment manufactured or produced in Georgia when the use of Georgia products does not sacrifice quality, increase the cost of the Work, or restrict or limit competitive bidding. If the Work includes forest products, Contractor and its Subcontractors shall use exclusively Georgia forest products if Georgia forest products are available. These provisions shall not apply when in conflict with Federal law, rules, and regulations concerning interstate commerce or construction.

1.1.4.4 Illegal Immigration Reform and Enforcement Act of 2011. Contractor certifies its compliance with Illegal Immigration Reform and Enforcement Act of 2011 and specifically those provisions codified at O.C.G.A. § 13-10-90 et seq. Contractor warrants that it has registered with and uses the federal work authorization program commonly known as “E-Verify.” Contractor further agrees that it will contract for the physical performance of services in satisfaction of this Contract only with Subcontractors who present an affidavit as

required by O.C.G.A. § 13-10-91. Contractor warrants that it will include a similar provision in all contracts entered into with Subcontractors for the physical performance of services in satisfaction of this Contract.

1.1.4.5 Drug-Free Workplace. Contractor certifies that it will provide a drug-free work place in accordance with the Drug-Free Workplace Act, O.C.G.A. §§ 50-24-1 *et seq*.. Contractor certifies that it will secure from all Subcontractors the following written certification: "As part of the subcontracting agreement with (contractor's name), (subcontractor's name) certifies to the contractor that a drug-free workplace will be provided for the subcontractor's employees during the performance of this contract pursuant to paragraph (7) of subsection (b) of Code Section 50-24-3."

1.1.4.6 Applicable Sales and Use Taxes. Contractor shall pay all applicable sales and use taxes, including such taxes on Owner supplied tangible personal property that is to be incorporated into the Project as required by O.C.G.A. 50-24-1(h)(1). Prior to supplying such property, Owner shall provide notice of the amount of tax owed for such tangible personal property.

1.1.4.7 No Boycott of Israel. Contractor certifies that it is not currently engaged in, and agrees for the duration of this Contract not to engage in, a boycott of Israel, as defined in O.C.G.A. §§ 50-5-85.

1.1.4.8 Sexual Harassment Prevention. The State of Georgia is committed to providing a workplace environment free from sexual harassment for its employees and for all persons who interact with state government. The State of Georgia requires that its contractors and their employees and subcontractors who interact with State employees to act in a professional manner to contribute to a work environment that is free from sexual harassment. The State of Georgia has adopted a Statewide Sexual Harassment Prevention Policy, a copy of which is available on-line at http://doas.ga.gov/human-resources-administration/board-rules-policy-and-compliance/jointly-issued-statewide-policies/sexual-harassment-prevention-policy Pursuant to the State of Georgia's Statewide Sexual Harassment Prevention Policy, all contractors who are regularly on State premises or who regularly interact with State employees must complete sexual harassment prevention training on an annual basis. If Contractor has employees and Subcontractors that are regularly on State premises or who will regularly interact with State personnel, Contractor certifies that:

1.1.4.8.1 Contractor will ensure that such employees and Subcontractors have received, reviewed, and agreed to comply with the State of Georgia's Statewide Sexual Harassment Prevention Policy;

1.1.4.8.2 Contractor has provided sexual harassment prevention training in the last year to such employees and subcontractors and will continue to do so on an annual basis; or Contractor will ensure that such employees and Subcontractors complete the Georgia Department of Administrative Services' sexual harassment prevention training located at this direct link https://www.youtube.com/embed/NjVt0DDnc2s?rel=0 prior to accessing State premises and prior to interacting with State employees; and on an annual basis thereafter; and

1.1.4.8.3 Upon request of the State, Contractor will provide documentation substantiating such employees and subcontractors' acknowledgment of the State of Georgia's Statewide Sexual Harassment Prevention Policy and annual completion of sexual harassment prevention training.

1.1.5 Applicable Codes. The latest edition of the regulations, rules, and codes listed below, with all amendments as of the date of permitting for construction, shall govern all Work. The following codes, rules, and regulations are adopted and incorporated into the Contract, and it shall be the responsibility of Contractor to familiarize itself with the requirements of these codes, rules, and regulations as applied to the performance of the Work.

1.1.5.1 Building Codes. The following Building Codes, as approved by the Georgia Department of Community Affairs, shall be used. (*See* O.C.G.A. § 8-2-20 *et seq.)* Design Professional will designate any additional codes or special modifications in the Construction Documents.

- International Building Code, with Georgia Amendments
- International Fire Code, with Georgia Amendments
- International Plumbing Code, with Georgia Amendments
- International Mechanical Code, with Georgia Amendments
- International Fuel Gas Code, with Georgia Amendments
- National Electrical Code, with Georgia Amendments

- International Energy Conservation Code, with Georgia Supplements and Amendments

1.1.5.2 Fire, Life Safety, and Accessibility Codes. The following codes, in the versions approved by the Georgia State Fire Marshal/Fire Safety Commissioner and Department of Human Resources, shall be used. Design Professional will designate any additional codes or special modifications in the Supplementary General Requirements.

- Georgia State Life Safety Code (NFPA 101)
- State Accessibility Codes (*See* O.C.G.A. § 30-3-3)
- Rules and Regulations of the Georgia Safety Fire Commissioner

1.1.5.3 Adherence to Contract When in Excess of Code. The Construction Documents shall govern when they call for quality of materials, quality of workmanship, or quality of construction which is equal to or in excess of the quality required by the codes stated above.

1.1.5.4 Variances. If Contractor observes that the Construction Documents are at variance with any laws, ordinances, rules, regulations, or codes stated above, it shall promptly give Notice to Owner. If Contractor performs any Work contrary to such laws, ordinances, rules, regulations, or codes without providing such prior Notice to Owner, it shall bear all costs arising therefrom. No variances from the Contract are allowed except to the extent that the said variances are necessary to comply with the above-stated codes. If any express requirements of the Contract are at variance with the above-stated codes, a Change Order shall be executed to bring the Contract into compliance with the above-stated codes.

1.1.6 Notice. Any Notice or other material communication required or permitted under this Contract shall be in writing, dated, and signed by an officer or duly authorized representative of the party making same. Unless otherwise required by the provisions of this Contract, Notice may be sent via electronic mail, fax, U.S. Mail, or hand delivered to the addresses shown in Section 3 of the Form of Contract. All members of the Project Team shall be copied on any Notice. The persons and addresses to which notices should be given may be changed by Notice given in accordance with this Section. Such Notice shall be effective as of the date on which it is received or would have been received but for the refusal of the addressee to accept delivery.

1.1.7 Order of Precedence of Contract and Changes. In the event of conflict among the Contract documents, a Change Order shall control over any previous Change Order; and a Change Order shall control over the Supplementary General Requirements, which shall control over the Form of Contract, which shall control over the General Requirements, which shall control over the Specifications.

1.1.8 Order of Precedence in Construction Documents. The following general principles shall govern the settlement of disputes that may arise over conflicts in the Construction Documents: (a) as between the drawings and specifications, the specifications shall govern; (b) as between figures given on drawings and the scaled measurements, the figures shall govern; and (c) as between large-scale drawings and small-scale drawings, the larger scale shall govern. Conflicts discovered shall be immediately reported to Design Professional.

1.1.9 Intellectual Property Rights in Construction Documents, Drawings, and Models. The Construction Documents and other documents prepared by Design Professional for the Project are the property of Owner. Neither Contractor nor any Subcontractor shall own or claim a copyright in such drawings, specifications, and other similar or related documents; Owner shall retain all common law, statutory, and other intellectual property rights with respect thereto. All models are the property of Owner.

1.1.10 Licenses, Easements and Surveys. Permanent easements for structures shall be obtained and paid for by Owner unless otherwise specified. Any licenses necessary for the permanent operation of the completed Project shall be obtained by the Owner unless otherwise specified. Owner shall furnish all surveys unless otherwise specified.

1.1.11 Owner's Right to Perform Other Work at the Project Site. Owner reserves the right at any time, upon Notice to Contractor, to perform other work at the Site. Contractor shall afford Owner and Separate Contractors reasonable access to the Site, subject to the Separate Contractors' compliance with Contractor's safety rules and Site specific policies, reasonable areas for storage of materials and equipment, and reasonable opportunity to execute work at the Site. Contractor shall, if required by the Contract, coordinate its work with Owner's Separate Contractors but shall have no responsibility to certify the suitability or correctness of any work performed by Separate Contractors.

1.2 Bonds, Insurance and Indemnification

1.2.1 Bonds. Upon execution of the Contract, Contractor shall furnish both a performance bond and a payment bond, in the exact form attached hereto, with a penal sum equal to at least the Contract Sum. Surety companies must be acceptable to Owner. Only those sureties listed in the Department of Treasury's Listing of Approved Sureties (Department Circular 570, as amended) are acceptable to Owner. All bonds at the time of issuance must be issued by a company authorized by the Insurance Commissioner to transact the business of suretyship in the State of Georgia, and shall have an A.M. Best Policyholders Rating of "A-" or better and with a financial size rating of Class V or larger. When any subsequent Change Order, or combination of Change Orders, increases the Contract Sum by five percent (5%) or more, Contractor shall obtain a rider to the payment and performance bonds increasing the penal sum to match the increased Contract Sum.

1.2.2 Indemnification Obligation. Contractor shall indemnify, defend, and hold harmless Owner, the State of Georgia and its departments, agencies and instrumentalities, and all of their respective officers, members, employees, and directors (hereinafter collectively referred to as the "Indemnitees") from and against any and all claims, suits, judgments, liability, demands, losses, costs, or expenses, including reasonable attorneys' fees and other costs of litigation including expert witnesses, arising out of bodily injury (including death), personal injury, and property damage arising out of or resulting from the performance of this Contract or any act or omission on the part of Contractor, its Subcontractors, its agents, employees, or others working at the direction of Contractor or on its behalf, or due to any breach of this Contract by Contractor, or due to the application or violation of any applicable Federal, State or local law, rule, or regulation. The indemnification obligation set forth in this Section extends to the successors and assigns of Contractor, and will survive the termination of the Contract or Contractor's performance hereunder and the dissolution or, to the extent allowed by law, the bankruptcy of Contractor. If and to the extent such damage or loss (including costs and expenses) covered by such indemnification obligations is paid by the State Tort Claims Trust Fund, the State Authority Liability Trust Fund, the State Employee Broad Form Liability Fund, the State Insurance and Hazard Reserve Fund, or other self-insured funds (all such funds hereinafter collectively referred to as the "Funds") established or maintained by the State of Georgia Department of Administrative Services Risk Management Division (hereinafter "DOAS"), Contractor agrees to reimburse the Funds for such monies paid out by the Funds. Whenever Contractor is obligated to defend the Owner or any other Indemnitee pursuant to this Agreement, Contractor shall use counsel selected or approved by Owner.

1.2.2.1 This indemnification obligation does not extend beyond the scope of the Project, this Contract, and the Work or obligations undertaken thereunder. Nor does this indemnification extend to claims for losses or injuries or damages incurred due to the sole negligence of the Indemnitees.

1.2.2.2 This indemnification does not extend to claims for loses or injuries or damages incurred by the Indemnitees due solely to the negligent acts, errors, or omissions of Design Professional in the performance of professional services in connection with the Project that fail to meet the applicable professional standard of care, skill, and ability as employed by others in their profession.

1.2.3 Insurance Coverage. Contractor shall procure the insurance coverages identified below in accordance with the policy requirements listed below. Contractor shall provide Owner with a Certificate of Insurance showing the required coverage prior to execution of this Contract. If Owner requests, Contractor shall provide a certified copy of insurance policies required hereunder. Owner owes no duties or contractual obligations to any third party and will not be liable to any third party for Contractor's failure to obtain, or failure to require its Subcontractors to obtain, the insurance required hereunder or required by law.

Worker's Compensation Insurance	**Minimum Coverage Limit**
	Coverage to meet Georgia statutory requirements
Employer's Liability Insurance	**Minimum Coverage Limit**
Bodily Injury by Accident	$1,000,000 per Accident
Bodily Injury by Disease	$1,000,000 per Employee $1,000,000 Aggregate
Commercial General Liability Coverage	**Minimum Coverage Limit**

Premises and Operations	$ 1,000,000.00 per Occurrence and $2,000,000 General Aggregate
Products and Completed Operations	$1,000,000.00 per Occurrence and $2,000,000 General Aggregate
Personal and Advertising Injury	$ 1,000,000.00 per Occurrence
Commercial Automobile Liability Coverage	**Minimum Coverage Limit**
	$ 1,000,000.00 combined single limits covering all owned, non-owned, leased or borrowed vehicles used by Contractor in connection with the Work
Commercial Umbrella Liability	**Minimum Coverage Limit**
Projects with Contract Sum Less than $5,000,000	$ 5,000,000 Per Occurrence and General Aggregate
Projects with Contract Sum Less than $15,000,000	$ 10,000,000 Per Occurrence and General Aggregate
Projects with Contract Sum Equal to or Greater than $15,000,000	$20,000,000 Per Occurrence and General Aggregate
Builder's Risk	**Minimum Coverage Limit**
	Coverage in an amount equal to Contract Sum

1.2.3.1 Workers' Compensation Policy Requirements. A group insurer must submit a certificate of authority from the Insurance Commissioner approving the group insurance plan.

1.2.3.2 Commercial General Liability Policy Requirements. Commercial General Liability Insurance shall be provided by the 2004 ISO Occurrence Form, or its equivalent, that shall include, without limitation, coverage for bodily injury and property damage arising from premises and operations liability, independent contractors, products and completed operations, blasting and explosion, collapse of structures, underground damage, personal and advertising injury, and contractual liability. The Commercial General Liability policy shall contain no exclusion for Subcontractor work and may not contain ISO endorsement CG 22 94 10 01 or similar. The policy must include separate aggregate limits per project.

1.2.3.3 Commercial Business Automobile Liability Requirements. The Commercial Business Automobile Liability Insurance shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned, or hired automobile and shall be issued on an "occurrence" basis.

1.2.3.4 Commercial Umbrella Liability Requirements. Commercial Umbrella Liability Insurance shall provide excess coverage above the Commercial General Liability, Commercial Business Automobile Liability and the Workers' Compensation and Employers' Liability and shall be issued on an "occurrence" basis.

1.2.3.5 Additional Insured Requirements. Contractor shall cause its insurer to issue an additional insured Endorsement naming Owner and all Indemnitees as additional insureds on all required liability policies (except for Workers Compensation and, if required, Professional Liability).

1.2.3.6 Builders Risk Policy Requirements. Builder's Risk Policy shall be made payable to Owner and Contractor, as their interests may appear, and shall include in the interests of Contractor's Subcontractors. The policy shall be written on a Builder's Risk "All Risk," or its equivalent, and include coverage for collapse, pollution, water or flood damage, earthquake, subsidence, testing, and boiler and machinery perils (unless covered by separate insurance). The form of policy for Builder's Risk shall be "Completed Value." The Builder's Risk Policy shall have a deductible of not more than $25,000 (or such other amount as approved by Owner in writing), and payment of the deductible shall be the responsibility of Contractor, except to the extent the loss is caused by Owner, in which case Owner shall pay a share of the deductible proportionate to its fault. The Builder's Risk Policy shall cover portions of the Work stored off site or in transit. The policy shall be endorsed as follows:

The following may occur without diminishing, changing, altering or otherwise affecting the coverage and protection afforded the insured under this policy:

(i) Furniture and equipment may be delivered to the insured premises and installed in place ready for use;

(ii) Partial or complete occupancy by Owner; and
(iii) Performance of work in connection with construction operations insured by Owner, by agents or lessees or other Contractors of Owner

In the event that the Contract is for renovation, addition, or modification of an existing structure and Builders Risk Insurance is not available, Owner will accept an Installation Floater Insurance Policy with the above endorsements in lieu of the Builders' Risk Insurance Policy. Such floater must insure loss to materials and equipment prior to acceptance by Owner and must be on an ALL RISK BASIS with the policy written on a specific job site.

1.2.3.7 Waiver of Subrogation. Contractor hereby waives all rights of subrogation against Owner and all Indemnitees and additional insureds required under this Contract to the extent a loss is covered by any insurance maintained by any party hereto, and Contractor shall require similar waivers from its Subcontractors. All insurance policies required to be maintained by Contractor shall contain a waiver of subrogation by the insurer in favor of the Owner and all Indemnitees and additional insureds required under this Contract.

1.2.3.8 Insurer Qualifications. All insurance providers shall be authorized by the Insurance Commissioner to transact the business of insurance in the State of Georgia for the applicable line of insurance, and shall have an A.M Best Policyholders Rating of "A" or better and with a financial size rating of Class V or larger.

1.2.3.9 Termination of Obligation to Insure. Unless otherwise expressly provided to the contrary, the obligation to insure as provided herein shall not terminate until Design Professional issues the Certificate of Final Completion. Contractor's obligation to provide Builder's Risk insurance shall terminate upon the issuance of the Certificate of Material Completion. In addition, any "claims-made" policies required hereunder shall be kept in full force and effect for a period of four (4) years after the issuance of the Certificate of Material Completion.

1.2.3.10 Deductibles. All deductibles shall be paid for by Contractor, except as provided in Section 1.2.3.6. The maximum deductible, except for Builder's Risk and Workers' Compensation qualified self-insurers or group self-insurers, in any policy shall not exceed one hundred thousand dollars ($100,000.00). Owner will consider larger deductible amounts on a case-by-case basis.

1.2.3.11 Certificate of Insurance Requirements. Contractor shall provide Owner with certificates of insurance, completed by a duly authorized representative, evidencing that at least the minimum coverages required herein are in effect and specifying that the liability coverages (except professional liability, if required) are written on an occurrence form. The certificates of insurance shall contain a provision that the coverage afforded under the policy or policies will not be canceled or non-renewed without thirty (30) days' prior written notice to Owner. The failure of Owner to demand such a certificate or other evidence of full compliance with these requirements or the failure of Owner to identify a deficiency from evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance. The acceptance of delivery by Owner or its designated representative of any certificate of insurance evidencing the required coverages and limits does not constitute approval or agreement by Owner that the insurance requirements have been met or that the insurance policies shown in the certificates of insurance are in compliance with the requirements. Owner shall have the right, but not the obligation, of prohibiting Contractor and its Subcontractors from entering the Project site until such certificates or other evidence that insurance has been placed in complete compliance with these requirements is received and approved by Owner. If Contractor fails to maintain the insurance as set forth herein, Owner shall have the right, but not the obligation, to purchase said insurance at Contractor's expense. Alternatively, Contractor's failure to maintain the required insurance shall constitute a material breach hereof and may result in termination of this contract at Owner's option. Provision of proper certificates of insurance as set forth herein by Contractor on behalf of itself and all Subcontractors actively operating on site is a condition precedent to payment hereunder. If any of the coverages are required to remain in force after final payment, an additional certificate evidencing continuation of such coverages shall be submitted with Contractor's final invoice and annually thereafter. Upon demand by the Owner, Contractor shall provide certified copies of any policy set forth herein.

1.2.3.12 Subcontractor Insurance Requirements. Contractor shall require each Subcontractor performing Work or performing any activity on the Project Site to obtain an insurance certificate showing proof of Commercial General Liability, Workers' Compensation Coverage and Employers Liability Insurance, Commercial Automobile Liability, Umbrella Liability, and Professional Liability (where required) with limits commercially appropriate for

the work of such Subcontractor and in no event less than $1,000,000 per occurrence, claim, accident, or employee, as applicable to each line of coverage, and Contractor shall provide Owner with an insurance certificate for each Subcontractor evidencing compliance with this provision annually and before such Subcontractor begins work on the Project.

1.3 Defined Terms and Basic Definitions

1.3.1 Defined Terms. Wherever used in the Contract, the terms defined in this Contract will have the meanings indicated that are applicable to both the singular and plural, and to the masculine and feminine thereof.

1.3.1.1 Meaning of Words and Phrases. Unless the context or the Contract taken as a whole indicate to the contrary, or unless otherwise defined, words used in the Contract that have usual and common meanings shall be given their usual and common meanings; words having technical or trade meanings shall be given their customary meaning in the subject business, trade, or profession. Materials or Work described in words that, so applied, have a well-known technical or trade meaning shall refer to such recognized meaning.

1.3.1.2 Install, Deliver, Furnish, Supply, Provide and Other Such Words. Install, deliver, furnish, supply, provide, and other such words mean that the Work in question shall be put in place by Contractor ready for use unless expressly provided to the contrary.

1.3.1.3 Sections Not Plenary. This Section and Section 1.3.2 are not entire, plenary, or exhaustive of all terms used in this Contract.

1.3.2 Basic Definitions.

1.3.2.1 Bidding Documents. The Bid Requirements, Contract, Specifications, Drawings, and all Addenda, which form the basis for the bid submitted by the bidder.

1.3.2.2 Certificate of Material Completion. The Notice from Design Professional certifying achievement of Material Completion.

1.3.2.3 Change Order. A document which, in conformity with the Contract, authorizes a change or changes to the Contract Sum, the Contract Time, or the Contract.

1.3.2.4 Change Order Sum. The amount of compensation payable under a Change Order or, when applicable, a portion thereof.

1.3.2.5 Change Order Work. Work that is authorized or changed by a Change Order.

1.3.2.6 Claim. A demand or assertion by Contractor seeking an adjustment of the Contract Sum, Contract Time, or both, or regarding other disputes or requests by Contractor for relief arising out of or relating to the terms of the Contract.

1.3.2.7 Construction Documents. The Specifications and Drawings that set forth the design for the Project, including any Drawings and Specifications that have been incorporated into the Contract by Change Order.

1.3.2.8 Construction Phase. The phase of the Project, commencing with the first Proceed Order, when physical work is performed on the Site.

1.3.2.9 Construction Progress Schedule. A schedule, as more fully defined in Section 2.1.4, prepared by Contractor indicating proposed milestone dates, activity sequences, and durations.

1.3.2.10 Contract. The Contract include the Contract, General Requirements, Supplementary General Requirements, Change Orders, and any Construction Documents that have been incorporated into the Contract by Change Order.

1.3.2.11 Contract Sum. The sum of all compensation authorized by the Contract and any Change Orders.

1.3.2.12 Contract Time. The period of time established for completion of the Work and the Project by the Contract.

1.3.2.13 Cure Period. The time stated in a Notice of Non-Compliant Work for correction of Non-Compliant Work.

1.3.2.14 Days, Months, Years. All references to the terms "day," "days," "month," or "months" mean calendar day, calendar days, calendar month, or calendar months, respectively.

1.3.2.15 Drawings. The graphic portion of the Construction Documents showing the design, location and dimensions of the Work.

1.3.2.16 Certificate of Final Completion. The certificate issued by Design Professional stating that all Work has been completed in accordance with the terms of the Contract.

1.3.2.17 Final Completion. The full and final completion of all Work in accordance with the Contract.

1.3.2.18 Final Punchlist. The Punchlist complied by the Design Professional at the Inspection for Material Completion which lists all Minor Items and Permitted Incomplete Work.

1.3.2.19 Initial Punchlist. Punchlist prepared by Contractor prior to the inspection for Material Completion that lists all Minor Items and Permitted Incomplete Work.

1.3.2.20 Material Completion. Material Completion occurs when the Work of the Project is complete in accordance with the Contract, except for any Minor Items or Permitted Incomplete Work, so that Owner can occupy and utilize the Work for its intended use.

1.3.2.21 Material Completion Date. The date by which Contractor shall achieve Material Completion of the Project.

1.3.2.22 Minor Item. A Minor Item is a portion of Work designed by Design Professional that is incomplete at Material Completion but does not interfere with the complete use and enjoyment of the Project by the Owner and which can be completed within thirty (30) days while the Owner occupies the Project without interfering with the Owner's use and occupation of the Project.

1.3.2.23 Notice. The written document from any Project Team Member that invokes a right or requests a remedy under this Contract or provides any notice required by the terms of this Contract.

1.3.2.24 Non-Compliant Work. Work that, for any reason, is not in compliance with the Contract in any respect, including but not limited to quality of Work or timeliness of Work. Such term shall also include the failure of Contractor to perform any obligation of the Contract in a proper or timely manner, to meet the Overall Project Schedule, or to supply an adequate and skilled work force.

1.3.2.25 Notice of Non-Compliant Work. The official Notice from Design Professional or Owner regarding Non-Compliant Work.

1.3.2.26 Notice of Readiness. The Notice provided by Contractor stating that the Work is ready for inspection by Design Professional.

1.3.2.27 Overall Project Schedule or OPS. The final Construction Progress Schedule that is recommended by Design Professional and approved by Owner, as amended from time to time as provided in this Contract.

1.3.2.28 Payment Application. The form, and any required supporting documentation, that must be submitted by Contractor to request payment from Owner.

1.3.2.29 Permitted Incomplete Work. Work that is required by the Contract to be completed after Material Completion, such as HVAC Seasonal Test and Balance or seasonal landscaping or Work that is incomplete through no fault of Contractor, such as recently added Change Order Work that is permitted by the Change Order to be performed after Material Completion.

1.3.2.30 Proceed Order. Notice from Owner to Contractor that authorizes Contractor to commence Work at the Project Site.

1.3.2.31 Project. The total and complete undertaking for the public works facility to be constructed under this Contract.

1.3.2.32 Request for Information (RFI). A request issued by Contractor to Design Professional requesting information or clarification of the Construction Documents.

1.3.2.33 Separate Contractor. Any person or entity other than Contractor that contracts directly with Owner to perform work on the Site.

1.3.2.34 Site. The real property furnished by Owner for the Work and use of Contractor.

1.3.2.35 Specifications. The portion of the Construction Documents consisting of written requirements for materials, equipment, and standards of workmanship.

1.3.2.36 Maximum Sum. The amount stated in a Force Account Authorization that sets the maximum amount payable for Work thereunder.

1.3.2.37 Subcontractor. Generic term for any party contracting to perform the Work or supply materials for the Work.

1.3.2.38 Submittals. Shop drawings, samples, schedules, data, catalogue cuts, manufacturers' published recommendations, charts, bulletins, brochures, illustrations, circulars, roughing drawings or formulae, or other documents that are submitted by Contractor to illustrate some portion of the Work or for use in installing the Work. Submittals are not Construction Documents.

1.3.2.39 Warranty Complaint. Notice that is given by the Owner to Contractor of apparent non-compliant or defective Work that arises or is discovered after Material Completion.

1.3.2.40 Work. All construction, materials, and services required by the Contract or reasonably inferable therefrom. The Work may refer to the whole Project or only a part of the Project.

1.4 Time

1.4.1 Duty to Commence and Complete Work. Contractor shall commence physical Work at the Project Site within ten (10) days of the issuance of the Proceed Order but shall not commence any physical Work on the Site until a Proceed Order is issued. Contractor shall achieve Material Completion of the Project not later than the Material Completion Date.

1.4.1.1 Time is of the Essence. Time is of the essence of this Contract and all obligations hereunder. Time being of the essence, it is mutually agreed that Owner will suffer damages if Contractor does not achieve Material Completion by the Material Completion Date and Contractor shall therefore compensate Owner for the delay as provided herein. Contractor has carefully examined and analyzed the Site, the Contract, Construction Documents, and all known factors related to its ability to achieve Material Completion by the Material Completion Date. Contractor agrees that the stipulated Contract Time is fair and reasonable.

1.4.1.2 Liquidated Damages for Delay. The parties may agree to an amount to paid as Liquidated Damages if Contractor fails to achieve Material Completion by the Material Completion Date. If the parties agree to Liquidated damages, such Liquidated Damages shall be stated in Section 5 of the Form of Contract. The specified liquidated damages are not a penalty but are agreed to in advance because of the difficulty of determining and proving the amount of delay damages incurred by the Owner as a result of the delay. Liquidated Damages shall be charged beginning upon the day following the contractually required Material Completion Date and ending on the date that the Certificate of Material Completion is issued. Liquidated Damages shall be deducted from payments due to Contractor as they accrue and such deduction shall be in addition to the retainage provided for in the Contract. If the parties do not agree to a sum for Liquidated Damages, Owner shall be entitled to recover its actual damages if Contractor fails to reach Material Completion by the Material Completion Day.

1.4.2 General Rule – No Damages for Delay, Extension of Time Sole Remedy. If, between the Proceed Order Date and the Material Completion Date, the critical path of Work based on the Overall Project Schedule is delayed without any fault of Contractor or its Subcontractors by an event that is beyond the reasonable control of Contractor or its Subcontractors, then such delay shall be excused and the Contract Time shall be extended for such period of delay. Contractor's sole remedy for such delays shall be an extension of time with no increase to the Contract Sum.

1.4.3 Exception to General Rule – Compensable Delay. Contractor shall be entitled to an extension of Contract Time and adjustment to the Contract Sum for the delays caused by an act or neglect of Owner, Design Professional, or Separate Contractor, on the condition that it submits a Notice of Claim in conformance with, and by the time set forth in, Section 1.5.3. As an additional condition precedent to such extension of Contract Time and adjustment to the Contract Sum, Contractor must prove that (i) such delays extended the critical path of Work based on the Overall Project Schedule; (ii) Contractor has taken all reasonable actions to mitigate the effects of the delay events; (iii) the fault or negligence of Contractor or Contractor's Subcontractors did not contribute to such delay events; and (iv) Contractor shall have provided Notice to Owner of the cause or causes of such delay within seven (7) days from the date on which Contractor first becomes aware, or should have become aware, of such delay.

1.5 Design Professional's Decisions and Claims

1.5.1 Continuation of the Work. Unless otherwise agreed in writing, and notwithstanding any other rights or obligations of either of the parties under the Contract, Contractor must proceed with the performance of the Work during the pendency of any Claim, dispute, protest, and other matter in question or during any alternative dispute resolution proceeding, court proceeding, or other proceeding to resolve any Claim, dispute, protest, and other matter in question. Unless otherwise provided herein, Owner will continue to make payments in accordance with the Contract, but Owner is under no obligation to make payments on or against such Claim, dispute, protest, and other matter in question during the time required to resolve such Claim, dispute, protest, and other matter in question.

1.5.2 Design Professional's Decisions. Whenever the Contract requires the Design Professional to make a determination on any issue, Design Professional shall issue its decision ("Design Professional's Decision") promptly. All Design Professional's Decisions on matters of aesthetics are final and binding on all parties if consistent with the requirements of the Contract. If Contractor desires to protest any Design Professional's Decision, then it shall issue a Notice of Protest to Owner and Design Professional no later than thirty (30) days after the Design Professional's Decision. Contractor's Notice of Protest shall be made in writing, shall include a title or subject line that clearly identifies the document as a "Notice of Protest" and shall set forth in detail the basis for the Protest. All Design Professional's Decisions shall be final and binding on Contractor in the absence of a timely Notice of Protest

1.5.3 Claim. If Contractor desires to assert a Claim against Owner, it shall issue a Notice of Claim within the time and in the form provided in this Section. Any and all Claims not made within the required time period, or in the required form, are waived by Contractor. The requirement of Contractor to provide a Notice of Claim under this Section shall be in addition to any requirement to provide Notice under any other Section hereof.

1.5.3.1 Form of Claims. A Notice of Claim shall be made in writing, shall be hand delivered or sent via U.S. Mail with return receipt, shall include a title or subject line that clearly identifies the document as a "Claim," shall identify the specific provision of the Contract upon which the Claim is based, and must set forth in detail the basis for the Claim. Claims for adjustments to the Contract Sum or other damages or compensation shall identify the amount of the Claim and shall include appropriate documentation of the amount claimed. Claims for extensions of Contract Time shall identify the number of days claimed, the cause of any delay, the affected schedule activities, and information to demonstrate critical path was extended.

1.5.3.2 Time for Submission of Claims. A Notice of Claim shall be made within fourteen (14) days after the occurrence of the event giving rise to the Claim or within fourteen (14) days after the event giving rise to the Claim should have been first observed, whichever is first, unless the Contract specifies a shorter or longer period with respect to such event, in which case such specific provision shall govern. In the case of a continuing delay as a result of a single event, only one Notice of Claim is necessary.

1.5.4 Claims Limited to Actual Costs. Unless otherwise provided herein, Claims for increase in the Contract Sum shall be no greater than the actual direct, jobsite costs incurred by Contractor. If any other provision of the Contract limits or precludes additional compensation to Contractor in certain events or circumstances, then any Claim for additional compensation related to such event or circumstance shall be limited or precluded as provided in such provision. As an additional condition to increase the Contract Sum, Contractor shall retain contemporaneous documentation of all costs supporting such increase and shall submit copies thereof to Owner along with the Notice of Claim or, for continuing Claims, on a daily basis after submitting the Notice of Claim.

1.5.5 Initial Dispute Resolution. If a dispute arises out of or relates to this Contract, the parties shall endeavor to settle the dispute first through direct discussions between the parties' representatives who have the authority to settle the dispute. If the parties' representatives are not able to promptly settle the dispute, they shall refer the dispute to the senior administrators of the parties who have the authority to settle the dispute, who shall meet within fourteen (14) days thereafter. If the dispute is not settled by the senior administrators, the parties may submit the dispute to mediation in accordance with Section 1.5.6.

1.5.6 Mediation. If the dispute cannot be settled pursuant to Section 1.5.5, the parties may elect, by mutual agreement, to submit the dispute to mediation. The parties agree to commence such mediation within sixty (60) days of electing mediation. The parties shall select a mutually agreeable mediator and shall share the cost of the mediator

equally. Either party may terminate the mediation at any time after the first session, but the decision to terminate shall be communicated directly by the party's representative to the other party's representative and the mediator.

1.5.7 No Litigation. No litigation may be commenced without first following the initial dispute resolution process in Section 1.5.5. Litigation may be filed only in the Superior Court of Fulton County, Georgia, pursuant to O.C.G.A. § 50-21-1, after the filing party provides thirty (30) days' Notice to the opposing party. The parties hereby agree that the Superior Court of Fulton County, Georgia shall have exclusive jurisdiction and venue in all matters concerning this Contract.

1.6 Contract Suspension and Termination

1.6.1 Right to Suspend Work. Owner or Design Professional may stop the Work upon observation of apparent Non-Compliant Work or whenever such stoppage may be necessary to protect the Work or protect the interests of Owner. The stop work order may be given orally, with Notice to be provided to Contractor within seventy-two (72) hours. If the Work is later determined by Design Professional to be conforming Work, and Contractor then complies with Section 1.5.3, Contractor shall be entitled to a compensable time extension in accordance with Section 1.4.3. If the Work is determined by Design Professional to be Non-Compliant Work, then Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time, and Owner may exercise any right hereunder with regard to such Non-Compliant Work.

1.6.2 Owner's Right to Terminate Contract Without Cause. Owner may terminate the Contract at any time, without cause, upon giving Contractor fifteen (15) days' Notice. In the event Owner elects to terminate the Contract after, Owner shall pay Contractor, in accordance with the terms of the Contract for all Work executed prior to termination, and for the costs incurred by Contractor because of the termination, up to the unpaid balance of the Contract Sum.

1.6.3 Owner's Right to Terminate Contract for Cause. Owner may terminate the Contract if Contractor is in breach of a Notice of Non-Compliant Work; if Contractor makes a general assignment for the benefit of its creditors or if a receiver is appointed on account of its insolvency; if Contractor persistently disregards laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction over the Project; if Contractor abandons the Project for a period of fourteen (14) or more days; if Contractor is otherwise guilty of a substantial violation of any provision of this Contract; or for any reason that would permit Owner to terminate the Contract under applicable law. Owner may terminate the Contract for these causes, without prejudice to any other right or remedy under this Contract, at equity, or in law, upon giving Contractor fifteen (15) days' Notice of Owner's intent to terminate for cause.

1.6.3.1 Owner's Right to Complete Work Upon Termination for Cause. Upon termination for cause, Owner shall have the right to take possession of the Work, together with all materials, equipment, tools, and improvements thereon and to finish the Work by whatever reasonable method Owner may deem expedient.

1.6.3.2 Payment Due Upon Termination for Cause. Upon termination for cause, Contractor shall not be entitled to receive any further payment until the Work is completed. Upon completion, Contractor shall pay to Owner the positive excess of (i) Owner's cost of completion of the Work, plus any damages incurred by Owner due to such termination and the basis for such termination, including but not limited to liquidated damages for delays in completion, over (ii) the unpaid balance of the Contract Sum. Upon completion, Owner shall pay the positive excess of (i) the unpaid balance of the Contract Sum over (ii) Owner's cost of completion of the Work, plus any damages incurred by Owner due to such termination or the basis for such termination, including but not limited to liquidated damages for delays in completion.

1.6.3.3 Determination of Wrongful Termination. In the event a court of competent jurisdiction determines (or the parties agree to settle with a consent determination) that a termination for cause is wrongful or not authorized by the terms of the Contract, the termination shall be considered to be a Termination For Convenience, and the sole remedy available to Contractor shall be the contractual treatment of the termination pursuant to Section 5.1.2 without any other damages, relief, or compensation.

1.6.4 Contractor's Right to Terminate for Nonpayment. If Owner fails to pay Contractor the amount due within the time required by the Contract, Contractor must give Notice to Owner of such nonpayment. If Owner fails to pay such amount or provide a Notice of a dispute as to the amount sought by Contractor within thirty (30) days after receipt of Contractor's Notice of nonpayment, Contractor may terminate this Contract by giving the Owner fifteen days' Notice of Contractor's Intent to Terminate. Upon such termination and upon providing Owner with all releases in the same manner as would be required upon Final Completion, Owner will pay Contractor, as provided in the applicable provisions of Section 4, for the Work properly executed, and, only if Contractor submits a Claim in the manner and time provided in Section 1.5.3, for any proven damages sustained or cost incurred for any materials, equipment, tools, construction equipment and machinery, and cancellation charges on obligations of Contractor outstanding as of the termination. The remedies provided in this Section shall be the sole remedies of Contractor for such termination for cause.

1.6.5 Notices of Termination. Notwithstanding any other provision of this Contract, if either party elects to terminate this Contract under any provision in Section , then the terminating party will issue a written Notice of Termination that shall be sent by Certified Mail, Return Receipt Requested.

1.6.6 Cumulative Remedies. Except as otherwise provided herein, each of Owner's rights and remedies provided for in this Contract shall be cumulative and shall be in addition to every other right or remedy provided for in this Contract, at law, or in equity, or by statute or otherwise. The exercise or beginning of the exercise of any one or more of the rights or remedies provided for in this Contract, at law, or in equity, or by statute or otherwise, shall not preclude the simultaneous or later exercise of any or all other rights or remedies provided for in this Contract, at law, or in equity, or by statute or otherwise. Owner's rights and remedies hereunder shall survive any termination by Owner or Contractor.

2 THE WORK

2.1 Pre-Construction Requirements

2.1.1 Pre-Construction Phase. The Pre-Construction Phase commences with the execution of the Contract and ends with the issuance of the Proceed Order. No physical Work may be done at the Project Site until the Proceed Order is issued.

2.1.2 Pre-Construction Meeting. Upon execution of the Contract, a Pre-Construction Meeting shall be held between the Owner, the Contractor and the Design Professional to review the Project, inspect the existing facilities, and set up the approximate work sequence schedule.

2.1.3 Inspection of Existing Facilities Prior to Commencing Work. If the Project involves renovations or modifications to existing facilities, the Owner, Contractor, and Design Professional shall jointly inspect the existing facilities to identify any damage to existing work and shall prepare a schedule identifying and showing the location of any damage to the existing work which is ascertainable by inspection. It is agreed that the preparation of the schedule is for the benefit of the Contractor and is intended to enable it to have the protection afforded by a record of such existing damage as is visually ascertainable. The Contractor shall have no responsibility to repair any damage that shall appear on the above-mentioned schedule nor shall he be responsible for repairing any existing damage which was not ascertainable by visual inspection or which was not the result of negligence on his part, unless such repair is included in the Work.

2.1.4 Submission of Overall Project Schedule. Within ten (10) days of the Pre-Construction Meeting, Contractor shall submit to the Owner and Design Professional for approval a Construction Progress Schedule showing the critical path of the Work, agreed upon milestone dates through Material Completion, and dates for submission of Submittals. Upon recommendation by Design Professional and approval by Owner, the Construction Progress Schedule shall become the Overall Project Schedule, which shall be utilized by Design Professional, Owner, and Contractor.

2.1.5 Submission of Safety Plan. Within ten days of the Pre-Construction Meeting, the Contractor shall prepare and submit to the Owner a specific safety program for the Work which shall identify the person in charge of Project Safety for the Contractor. The Contractor shall establish and require all subcontractors to establish reasonable safety programs.

2.1.6 Submission of Schedule of Values. Within ten days of the Pre-Construction Meeting, Contractor shall submit a Schedule of Values in accordance with Section 2.6.1.

2.1.7 Permits & Licenses. Contractor shall obtain and pay for all permits and licenses necessary for the prosecution of the Work. Owner shall cooperate with Contractor as it secures building and other permits, licenses, and inspections that are required to be obtained by Contractor.

2.1.8 Utilities. If permanent utilities are available at the Site, the Owner shall furnish without cost to the Contractor water and electricity as presently available at the Site as required to do the Work, provided however that the Contractor shall pay the costs of any separate connections. The Contractor shall make connection to utilities at locations agreeable to the Owner. The Contractor shall pay all costs for connections and extending these to the area where it proposes to use them. If permanent utilities are not available at the Site, Contractor shall obtain temporary utilities and provide sewage disposal at its expense until the extension and connection of permanent utilities and shall pay for all such utility services until Material Completion has been achieved.

2.1.9 Submission of Documents for Issuance of Proceed Order. Contractor shall submit the following documents as a prerequisite to Owner's issuance of the Proceed Order: Payment and Performance Bonds, Insurance Certificates, Worker's Compensation and Employer's Liability Insurance Certificates for all Subcontractors, Subcontractors' Affidavit for Georgia Security and Immigration Compliance, Project Safety Plan, Construction Progress Schedule, and Schedule of Values.

2.2 Construction Phase Requirements

2.2.1 Review of Construction Documents. Prior to commencing the Work, Contractor shall review all Construction Documents for any inconsistency, ambiguity, error, or omission. When potential design issues are identified, Contractor shall annotate the Construction Documents and shall issue an RFI in writing to the Design Professional. Design Professional shall furnish complete, definite, and clear instructions in response to the RFI in writing, or by issuing drawings, or both. In the event instructions are given orally for expediency, they shall be confirmed in writing or by drawings within five (5) days following the oral instructions. Any such additional instructions shall be consistent with the Construction Documents and reasonably inferable therefrom. Contractor shall not proceed with the affected Work until receiving a response from the Design Professional. Contractor shall exercise skill and judgment in the performance of its review of the Construction Documents but does not warrant or guarantee any design services furnished by Design Professional

2.2.2 Construction Documents at Site and Recording Changes. Contractor shall keep at the Site at least one copy of the Construction Documents in good order and available to Design Professional and to its representatives. Contractor shall record all changes and shall annotate a copy of the Construction Documents to reflect the as-built condition.

2.2.3 Progress Reports. During the Construction Phase, Contractor shall monitor the progress of the Work for conformance with the Overall Project Schedule and keep Owner informed of such progress and shall maintain records documenting the progress of the Work. Contractor shall submit progress reports at intervals reasonably determined by the Owner. Progress Reports shall document the progression of the Work and shall include information on the percentage of completion and indicate completed activities and any changes in sequencing or activity durations, including approved Change Orders. Progress Reports also note dates by which Non-Compliant Work shall have been cured and note the actual date of cure of the Non-Compliant Work.

2.2.4 Supervision of Work. Contractor shall supervise and direct the Work using diligent skill and attention in order to ensure satisfactory progress of the Work and that the quality of the Work complies with the Contract. Contractor shall be responsible for and shall coordinate all construction means, methods, techniques, sequences, and procedures. Contractor is fully responsible to Owner for the acts and omissions of its officers, employees, agents, all Subcontractors and their respective officers, employees and agents, and all other persons on the Site at the direction of Contractor or to perform Work. Non-performance, improper performance, or other default by any Subcontractor or employee or agent of Contractor shall not excuse Contractor from its obligation to assure timely performance of the Work in compliance with the Contract.

2.2.5 Project Superintendent. Contractor shall ensure that a competent Superintendent remains on the Project, on a full-time basis, until Material Completion. A Superintendent shall be present to supervise completion of all Punchlist Items and Permitted Incomplete Work. All directions given to the Superintendent shall be as binding as if given to Contractor. The Superintendent shall not be changed except with the consent of Owner unless the Superintendent ceases to be in Contractor's employ. Contractor must obtain Owner's prior written approval before engaging a replacement Superintendent and must ensure that the replacement has similar qualifications and experience to the original Superintendent.

2.2.6 Protection of Work, Property, and People. The Contractor shall provide protection of the Work, adjacent property, and persons on the Site and adjacent thereto. Contractor shall make good any damage, injury, or loss such Work, persons, or property, except to the extent the damage, injury, or loss is directly the result of errors in the Construction Documents or such as shall be caused directly by agents or employees of the Owner.

2.2.7 Safety. The Contractor is responsible for the safety of the Site and the Work. The Contractor shall comply with the rules and regulations of OSHA and/or the Department of Labor (O.C.G.A. § 34-2-6), and, where not inconsistent with the foregoing, the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc., for safety and prevention of accidents. Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the Work, proper safeguards for the protection of workmen and the public and shall post danger warnings against any hazards created thereby.

2.2.8 Emergencies. In an emergency affecting the safety of life or the work or of adjoining property, the Contractor, without special instruction or authorization from the Design Professional or Owner, shall act, at his discretion, to prevent such threatened loss or injury. Any compensation claimed by the Contractor on account of emergency work shall be determined in accordance with the Allowable Costs under Section 2.4.6.

2.2.9 Use of Premises. The Contractor shall confine its operation and storage to the Project Site and any other areas specifically indicated in the Contract. The Contractor shall have access to Site between 7:30 A.M. and 5:00 P.M. Monday through Friday and, upon written permission of the Owner, may make deliveries and have access to the Site at any hour of any day. Contractor's promise to perform the Work within the Contract Time stated is not dependent on the availability of the Site for hours other than identified hereinabove unless other hours are agreed upon at Contract execution.

2.2.10 Building Occupancy. Contractor acknowledges that portions of the Site are occupied by State employees performing essential tasks necessary to the efficient operation of State government. Contractor agrees that it shall perform all Work in such a manner as to provide the least possible disruption to the occupants. Contractor shall schedule Work and provide temporary ventilation and/or isolation to insure that fumes from welding, other construction tasks, and out-gassing from construction materials do not migrate to occupied areas. The Contractor shall provide such mats, drop cloths, etc., as shall be necessary to protect the surrounding areas from soil or damage. The Contractor and its personnel shall not use the passenger elevators for transportation of equipment, supplies, goods and material unless otherwise agreed to in writing by the Owner. Contractor shall use only those bathroom facilities specifically designated by the Owner for Contractor's use unless the Owner instructs Contractor to provide for temporary toilets.

2.2.11 Cleaning Up. The Contractor shall at all time keep the Site free from accumulations of waste material or rubbish caused by his employees or Work. At the end of each working day, Contractor shall leave the premises in a broom clean condition and remove all trash and debris.

2.2.12 Cutting, Patching and Fitting. The Contractor shall do all cutting, fitting, or patching required to complete the Work or to make its several parts come together properly and fit. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the Work unless otherwise required by the Contract.

2.2.13 Submittals. Contractor shall provide all Submittals as required by the Contract in accordance with the Overall Project Schedule. Contractor shall perform no portion of the Work for which the Contract requires Submittals until Design Professional has approved the respective Submittal. Contractor shall maintain at the Site one copy of all approved Submittals.

2.2.14 Hazardous Materials. A Hazardous Material is any substance or material identified as of the date of the Agreement as hazardous under any governmental law, rule, or regulation, or otherwise subject to governmental requirements concerning handling, disposal, and/or cleanup. Except for Hazardous Materials specifically identified to be remediated by the Contract, the Contractor shall not be required to perform any work related to Hazardous Materials encountered at the Site. The Contractor is fully responsible for any Hazardous Materials brought on the Site by the Contractor or any Subcontractor. Contractor shall immediately notify Owner and Design Professional of its discovery of and the location of any Hazardous Materials at the Site that were not anticipated or contemplated as part of the Work.

2.2.15 Differing Site Conditions. If the Contractor encounters conditions at the Site that are subsurface or concealed conditions that materially differ from those expressly identified in the Contract or conditions at the Site that are materially different than those conditions anticipated or expected by a reasonably observant and prudent construction contractor, then Contractor shall promptly provide notice to the Owner and Design Professional. If Design Professional determines that such conditions differ materially from those identified in the Contract or those reasonably anticipated, and such difference shall cause an increase or decrease in the Contractor's costs or time, the Design Professional shall recommend an equitable adjustment.

2.2.16 Contract Provisions Required in All Subcontracts. Contractor agrees to bind every Subcontractor to the terms of the Contract insofar as they are applicable to its Work. Contractor shall expressly name Owner as an intended third-party beneficiary of each Subcontract.

2.3 Warranties, Inspections and Correcting the Work

2.3.1 Construction Warranty. All Work shall be free from defects and conform to the requirements of the Contract. Unless otherwise specified, all materials shall be new, and both workmanship and materials shall be of good quality. Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials and Work. Such warranties are referred to herein as the Construction Warranty. In addition to the Construction Warranty, Contractor shall provide all additional warranties called for in the Construction Documents. These warranties shall be in such form as to permit direct enforcement by Owner against any Subcontractor or third party whose guaranty or warranty is called for. The calling for or the furnishing of written warranties or bonds shall in no way limit the Construction Warranty and the contractual obligations of Contractor hereunder, including but not limited to the obligation correct the Work as set forth in Section 2.3.7. The remedies stated in this Section are in addition to the remedies otherwise available to Owner, do not exclude such other remedies, and are without prejudice to any other remedies.

2.3.2 Inspection of the Work. Both Contractor and Design Professional have separate duties to inspect the Work. Inspection of the Work by Owner, Design Professional or any third party shall not diminish, relieve, or alter the responsibility of Contractor to ensure that all Work complies with the Contract. The failure of Owner, Design Professional, or other third-parties to discover or notify Contractor of the existence of Non-Compliant Work shall not relieve Contractor of its responsibility to ensure that all Work complies with the Contract, and neither Design Professional's Certificate of Material Completion or Certificate of Final Completion nor payment shall relieve Contractor of responsibility to ensure that all Work complies with the Contract.

2.3.3 Contractor's Inspection of the Work. Contractor has an indivisible, non-delegable, and nontransferable contractual obligation to Owner to make inspections of the Work at all stages to confirm at all times that all Work has been executed strictly in accordance with the Contract. Contractor shall not rely on an inspection by Owner, Design Professional, or any other third party to identify Non-Compliant Work.

2.3.4 Fire Marshal's Inspection of the Work. The State Fire Marshal may make inspections at any time. If the Work requires a Certificate of Occupancy, Contractor shall request a Fire Marshal Inspection at eighty percent (80%) completion and at one hundred percent (100%) completion and will give Notice when all items on the one hundred percent (100%) inspection report have been completed. Requests shall be in writing with a copy to Owner and Design Professional.

2.3.4.1 Eighty Percent (80%) Inspection. The Eighty Percent (80%) Inspection shall take place when the structural components, including the fire walls, vertical shafts, stairways, smoke stops, hazardous area separations, roof and ceiling assemblies, corridor and door width, and HVAC systems, are in place and open for review of the fire safety components.

2.3.4.2 One Hundred Percent (100%) Inspection. The One Hundred Percent (100%) Inspection shall take place when Contractor has completed all of the items noted on the Eighty Percent (80%) Inspection report and the building is ready for issuance of the Certificate of Occupancy.

2.3.5 Design Professional's Inspection of the Work. Design Professional shall inspect all Work for compliance with the Contract. At all times, Contractor shall permit Design Professional and its representatives to access the Work for inspection.

2.3.5.1 Notice to Design Professional Prior to Covering Work. If the Contract, laws, ordinances, or any public authority require any Work to be specially tested or inspected, Contractor shall give Design Professional timely Notice of its readiness for inspection and, if the inspection is by any authority other than Design Professional, will inform Design Professional of the date fixed for such inspection. Inspections by Design Professional shall be made promptly and, where practicable, at the source of supply.

2.3.5.2 False Starts. In the event Contractor shall have issued Notice of Readiness prematurely, its action shall be deemed to be a "false start." Contractor shall be liable for the costs and damages resulting from false starts, including but not limited to the salary, professional fees, and travel and living expenses of the persons or parties affected by false starts.

2.3.5.3 Inspection of Work Covered Without Consent of Design Professional. If any Work is covered without written approval or consent of Design Professional or contrary to any provision of the Contract, then Contractor shall uncover such Work for inspection by Design Professional. Contractor shall be liable for the costs of uncovering such Work, as well as the cost of recovering Work and the fees of Design Professional arising from the review of such uncovered Work.

2.3.6 Notice of Non-Compliant Work. The Owner or Design Professional may issue a Notice of Non-Complaint Work if it observes Non-Compliant Work, including failure to maintain the Overall Project Schedule. The Notice of Non-Compliant Work shall be in writing, dated, and addressed to Contractor with a copy to Owner or Design Professional, as applicable. The Notice of Non-Compliant Work shall include a description of the Non-Compliant Work, a citation to the provision of the Contract (or incorporated document or standard) that has been violated, and a reasonable period to correct the Non-Compliant Work ("Cure Period"). If Contractor is unsure or unaware of any information necessary to correct the Non-Compliant Work, it shall immediately request such information in writing. In the event that Owner incurs increased costs due to re-inspection of Work that was found to be Non-Compliant, Contractor shall be liable for the costs of the re-inspection, including but not limited to the salary, professional fees, and travel expenses of the Design Professional or inspection firm.

2.3.7 Duty to Promptly Correct Work. Contractor shall promptly correct any Non-Compliant Work within the Cure Period stated in the Notice of Non-Compliant Work. The duty to correct the Work shall apply whether the Non-Compliant Work is discovered before or after Material Completion. Contractor shall bear the costs of correcting such Non-Compliant Work, including, without limitation, additional testing and inspections and shall bear the expense of restoring all Work of Separate Contractors affected or destroyed by such removal or replacement. Contractor shall give prompt Notice upon completion of the correction of the Non-Compliant Work. In the absence of such Notice, it shall be and is presumed under this Contract that there has been no correction of the Non-Compliant Work.

2.3.7.1 Notice of Non-Compliant Work for Failure to Maintain Schedule. If Design Professional issues a Notice of Non-Compliant Work for failure to maintain the Overall Project Schedule, Contractor shall deliver to Design Professional and Owner a written plan explaining how Contractor intends to bring the Project back in compliance with the Overall Project Schedule within seven (7) days of the issuance of the Notice of Non-Compliant Work. Contractor's plan must provide sufficient detail to allow Design Professional and Owner to determine the proposal's feasibility.

2.3.7.2 Owner's Option to Accept Non-Compliant Work. If Design Professional and Owner deem it inexpedient to correct Non-Compliant Work, Owner may agree, in writing, to accept the Non-Compliant Work and make an equitable deduction from the Contract Sum which shall be deducted from Contractor's next payment.

2.3.7.3 Owner's Remedies for Breach of Notice of Non-Compliant Work or Failure to Prosecute the Work. If Contractor does not correct the Non-Compliant Work within the Cure Period stated in the Notice of Non-Compliant Work, Contractor shall be deemed to have breached the Notice of Non-Compliant Work. If Contractor breaches a Notice of Non-Compliant Work or fails to prosecute the Work in accordance with the Contract, Owner may, after giving five (5) days' Notice to Contractor, correct the Non-Compliant Work, prosecute the Work, or supplement the labor of Contractor or its Subcontractors and deduct the costs thereof from any payment then or thereafter due to Contractor and recover any resulting deficit from Contractor. The remedies stated in this Section are in addition to the remedies otherwise available to Owner and are without prejudice to any other remedies.

2.3.8 Correction of Non-Compliant Work After Material Completion. Contractor shall promptly remedy any Non-Compliant Work upon receipt of a Warranty Complaint received within one (1) year from the date of Material Completion, unless such Warranty Complaint is a result of a design defect or Owner abuse. Within seven (7) days of receipt of a Warranty Complaint from the Owner, Contractor shall issue a written response to the Owner stating Contractor's plan to correct the Work and the time needed to correct the Work. Contractor shall promptly commence correction of the Work unless the Design Professional agrees that the Warranty Complaint is the result of a design defect or Owner abuse. Contractor and its Subcontractors shall make no visits to the Site without first giving Notice to the Owner. Warranty Complaints should be corrected within fourteen (14) days of receipt unless the Work cannot be corrected within fourteen (14) days, in which case Contractor shall notify the Owner in its initial response. If Contractor does not provide the initial response within seven (7) days or remedy the Warranty Complaint within the

time specified in its initial response, upon five (5) days' Notice, Owner may remedy the Warranty Complaint, including but not limited to any resulting damage to the Work or other property, at the expense of Contractor.

2.3.9 Warranty Complaints - Emergency Situations. If the Warranty Complaint is an emergency, this will be noted and Owner may (i) require Contractor to correct the Work immediately or (ii) if the emergency involves risk of property damage or personal injury or death, Owner may proceed at once to remedy the Warranty Complaint. If, pursuant to the aforementioned clause (i), Contractor is requested to correct the Work, it shall respond to the Warranty Complaint in emergency situations within twenty-four (24) hours. If Contractor fails to respond within such time limit, Owner may remedy the Warranty Complaint and charge the cost thereof to Contractor, including but not limited to any resulting damage to the Work or other property. If, pursuant to the aforementioned clause (ii), Owner proceeds to remedy the Warranty Complaint in an emergency situation, then Owner will charge the cost thereof to Contractor, including but not limited to any resulting damage to the Work or other property.

2.3.10 No Limitation. Nothing contained in this Section 2.3 shall be construed to establish a period of limitation with respect to Contractor's liability for defective or Non-Compliant Work under this Contract, at law, or in equity. The remedies stated in this Section 2.3 are in addition to the remedies otherwise available to Owner and are without prejudice to any other remedies.

2.4 Change Orders

2.4.1 Change Orders. The Owner, without invalidating the Contract, may order changes in the Work consisting of additions, deletions, or modifications to the Work, with the Contract Sum and the Contract Time being adjusted accordingly. All such changes in the Work shall be authorized only by written Change Order signed by the Owner. (A sample change order form is attached hereto, however, the exact form to be used may differ and may be provided by the Design Professional or the Owner.) Without a Change Order executed by Owner, Contractor shall not make any changes in the Work or perform any work that is not a part of the Contract, nor shall Contractor receive any compensation or make any Claim therefor.

2.4.2 Change Order Sum. The Change Order Sum may be determined in one or more of the following ways: 1) by an estimate of Allowable Change Order Costs agreed upon in advance and paid as a lump sum ("Lump Sum Change Order"), 2) by Unit Prices named in the Contract or subsequently agreed upon, which Unit Prices shall include all Contractor overhead, profit, and markup ("Unit Price Change Order"), or 3) by the amount of actual Allowable Change Order Costs incurred in the performance of the Change Order Work ("Force Account Change Order").

2.4.3 Change Order Proposals. Owner shall provide Contractor with a proposed Change Order that shall include a description of Change Order Work provided by the Design Professional. Contractor shall promptly respond to the proposed Change Order with an estimate of the Allowable Costs of the Change Order Work and the impact to the Project Schedule. The response shall include an itemized breakdown of Allowable Change Order Costs and a justification to the change in the Project Schedule. The Contractor's justification is provided so that the Design Professional and Owner can determine the whether the proposed change in Contract Time or Contract Sum is reasonable and in compliance with the terms of the Contract.

2.4.3.1 Disagreement as to Change in Contract Sum. If Design Professional or Owner disagree with Contractor as to the amount of the proposed adjustment to the Contract Sum and such disagreement is not resolved promptly, then Owner, if it desires the Change Order Work to proceed, may direct the Change Order Work to commence under a Force Account Change Order in accordance with Section 2.4.5. In no event shall any increase in the Contract Sum for such Change Order Work exceed the increase identified in Contractor's response under Section 2.4.3.

2.4.3.2 Disagreement as to Change in Contract Time or Other Disagreements. If Design Professional or Owner disagrees with Contractor as to matters other than adjustments to Contract Sum, including but not limited to proposed adjustments to Contract Time, and such disagreement is not resolved promptly, then Owner, if it desires the Change Order Work to proceed, may direct the Change Order Work to commence, and the dispute shall be resolved as a Design Professional's Decision as set forth in Section 1.5.2.

2.4.4 Acceptance of Proposed Change Order. If Owner agrees with Contractor's proposed changes to the Contract Time and Contract Sum, then Owner shall execute the Change Order. Upon Owner's execution, the Change Order shall be binding and of full force and effect. All Change Orders shall be performed under the conditions of the original Contract except as specifically modified by the Change Order. The change in Contract Time and Contract Sum (if any) provided by the Change Order constitutes compensation in full to Contractor for the Change Order Work and accounts for all delays and impacts related thereto.

2.4.5 Force Account Change Orders. A Force Account may be used in the event (i) Contractor and Owner cannot agree on the Change Order Sum for a Lump Sum Change Order, (ii) costs associated with a Change Order cannot be reasonably determined prior to beginning the Change Order Work, (iii) Owner and Contractor have agreed to Unit Prices for the Work but cannot determine the number of Units involved in the Change Order, or (iv) Owner otherwise determines. To initiate a Force Account Change order, Owner will issue a Force Account Authorization that sets a Maximum Sum that shall be paid for the Change Order Work and authorizes the Contractor to proceed. Upon completion of the Force Account Change Order Work, a Change Order is executed that sets the Change Order Sum on the basis of the actual Allowable Change Order costs incurred, or in the case of Unit Prices, on the basis of the actual number of units.

2.4.5.1 Accounting for Allowable Change Order Costs. If Owner issues a Force Account Authorization, Contractor must provide a daily accounting of Allowable Change Order Costs incurred in accomplishing the Work. With respect to Unit Price Change Orders, Contractor must provide a daily accounting of units completed.

Owner shall be permitted, on a daily basis, to verify such records and information, and may require such additional records as are necessary to determine the Allowable Change Order Costs of such Change Order Work. Allowable Change Order Costs shall not exceed the Maximum Sum stated in the Force Account Authorization. Contractor is responsible for applying for an increase in the Maximum Sum if it believes the Allowable Costs incurred shall exceed the Maximum Sum.

2.4.5.2 Determining Final Cost of Force Account. Within fourteen (14) days after the conclusion the Change Order Work ordered by a Force Account Change Order, Contractor and Owner shall determine the total Change Order Sum. Such Change Order Sum shall be incorporated into and finalized in the Force Account Change Order.

2.4.6 Allowable Change Order Costs. Allowable Change Order Costs include the items in this Section, but only those costs that are incurred in the performance of the Change Order Work.

2.4.6.1 Allowable Subcontractor Costs. Allowable Subcontractor Change Order Costs shall include the costs of all materials and equipment used in completing the Change Order Work and the costs of all labor to physically perform the Change Order Work but shall not include any charges for small tools or other expendables.

2.4.6.2 Subcontractor Markup. Allowable Subcontractor Costs for Change Order Work include a markup of up to twenty percent (20%) on the Allowable Subcontractor Costs noted above to compensate the Subcontractor for its overhead and profit. If the Subcontractor uses a Sub-Subcontractor to perform a portion of the Change Order Work, the Sub-Subcontractor may receive a markup for its overhead and profit but the total markup for both the Subcontractor and the Sub-Subcontractor shall not exceed twenty percent (20%).

2.4.6.3 Contractor's Payment and Performance Bond and Insurance Costs. Allowable Change Order Costs include the increases in premiums for Contractor's Payment Bond and Performance Bonds and Insurance required under the terms of this Contract, but solely to the extent that such increased costs are a result of the Change Order. In no event shall Contractor's compensation for such costs exceed two percent (2%) of the Allowable Change Order Costs (excluding this Section).

2.4.6.4 Contractor's Costs for Self-Performed Work. If the Contractor performs Change Order Work with its own personnel ("Self-Performed Work), Allowable Change Order Costs shall include the costs of all materials and equipment used in the completing the Self-Performed Work and the costs of all labor to physically perform the Self-Performed Work but shall not include a Subcontractor markup unless expressly agreed to in advance by the Owner.

2.4.6.5 Contractor's Supervision Costs. Allowable Change Order Costs include increased costs of Contractor's Superintendent and field office personnel in direct supervision of the Change Order Work, but solely to the extent that such increased costs are a result of the Change Order.

2.4.6.6 Contractor's Mark-Up. Allowable Change Order Costs include a markup of up to seven and a half percent (7 ½%) on the Subcontractor's Allowable Costs to compensate the Contractor for its overhead and profit on the Change Order Work. If the Contractor is Self-Performing, Allowable Change Order Costs include a markup of up to seven and a half percent (7 ½%) on the Contractor's Costs for Self-Performed Work to compensate the Contractor for its overhead and profit on the Change Order Work.

2.4.6.7 Allowable Costs for Unit Price Change Orders. Unit prices shall be inclusive of all Contractor's overhead and profit and no mark-up on top of the Unit prices shall be allowed.

2.5 Project Closeout

2.5.1 Material Completion. To achieve Material Completion, the Work shall be materially complete so that the Owner can use and occupy the entire Project for its intended purpose. Additionally, Contractor shall complete the following Work and submit the Final Documents listed below as prerequisites to Material Completion.

2.5.1.1 Operation and Maintenance Training and Manuals. Prior to the inspection for Material Completion, Contractor shall provide the Owner with training in the operation and maintenance of any mechanical, electrical, or other operating systems and equipment included in the Work and shall provide manufacturer's manuals for operating and maintaining systems and equipment.

2.5.1.2 Warranties and Service Agreements. Contractor shall submit all warranties and maintenance service agreements as called for in the Specifications to the Design Professional at least seven (7) days prior to the proposed date of Inspection for Material Completion.

2.5.1.3 Marked-up Construction Documents. At the inspection for Material Completion, Contractor shall provide a complete set of Marked-up Construction Documents to Design Professional, which shall reflect all changes caused by field changes, Change Orders, or observed changes by Contractor or Subcontractors for the purpose of Design Professional's issuance of Record Documents to Owner.

2.5.1.4 Initial Punchlist. Prior to the Inspection for Material Completion, Contractor shall prepare an Initial Punchlist itemizing all Minor Items and Permitted Incomplete Work and shall provide a copy of the Initial Punchlist to Design Professional and Owner. Contractor is encouraged to consult with Design Professional and Owner prior to finalizing the Initial Punchlist, in particular in arriving at consensus for Minor Items and Permitted Incomplete Work.

2.5.2 Inspections for Material Completion. Contractor shall request an Inspection for Material Completion when it has completed all Work, except for Minor Items and Permitted Incomplete Work and submitted all required documents, including Final Documents.

2.5.2.1 Cleaning Prior to Material Completion. Prior to the inspection for Material Completion, Contractor shall remove from the Site all waste and perform a thorough cleaning of the Work. Contractor shall dust all hard surfaces, mop all hard floors, vacuum all carpet, remove any stains and paint spots, clean and polish all plumbing fixtures and equipment, clean all electrical and mechanical equipment, and clean all ductwork and filters if dirty. Contractor shall also restore any existing facilities such as roads, landscaping, pavement, fencing, curbing, and the like at the Site to at least their pre-construction conditions. Contractor may leave equipment at the Site as necessary to achieve Final Completion of the Project. To achieve Material Completion, Contractor shall have fully cleaned the Site.

2.5.2.2 Notice of Readiness for Inspection for Material Completion. When Contractor determines that the Project is ready for Inspection for Material Completion, Contractor shall give Notice to Design Professional and Owner requesting Inspection for Material Completion. Such Notice shall be provided at least seven (7) days in advance of the date requested for Inspection for Material Completion. Such Notice shall include a copy of the Initial Punchlist. If Contractor requests inspection for Material Completion and it is determined by Design Professional that the Project has not reached Material Completion, referred to as a "false start," then Contractor shall be liable for the costs and damages resulting therefrom, including but not limited to the salary, professional fees, and travel and living expenses of the persons or parties affected by false starts.

2.5.2.3 Inspection, Certificate of Material Completion. Design Professional shall conduct the Inspection for Material Completion and shall confirm the Initial Punchlist by adding or deleting Minor Items or Permitted Incomplete Work as appropriate. Upon completion of the Inspection for Material Completion, if Design Professional determines the Work has reached Material Completion, Design Professional shall execute the Certificate of Material Completion and attach a first draft of a Final Punchlist, which may be handwritten or in electronic format and which shall list all Minor Items and Permitted Incomplete Work and assign amounts to be withheld from the Payment for Material Completion on account of each Minor Item and Permitted Incomplete

Work.. The Final Punchlist shall include completion dates for the Permitted Incomplete Work. All Minor Items shall be completed within thirty (30) days of Material Completion.

2.5.2.4 Payment for Material Completion. Upon Material Completion, Contractor shall submit a Payment Application along with a Payment Affidavit certifying completion of all Work in accordance with the Contract, except for Minor Items and Permitted Incomplete Work, and releasing all claims against the Owner of any nature arising out of the Project except any claims noted on the Payment Affidavit. If Contractor fails to provide a Payment Affidavit, Payment for Material Completion shall operate as settlement, waiver, release, discharge, and payment in full of all claims (including Claims) against Owner of any nature arising out of the Project except for the Work associated with the Minor Items and the Permitted Incomplete Work.

2.5.2.5 Effect of Failure to Achieve Material Completion. Should Material Completion not be achieved by the Material Completion Date, Contractor is in breach of the covenant of time, Liquidated Damages at the specified daily rate in Section 5 of the Contract begin to accrue and are payable on the day immediately following the Material Completion Date.

2.5.2.6 Material Completion Not a Waiver. A determination that Contractor has achieved Material Completion, the issuance of a Certificate of Material Completion, or Owner's Payment for Material Completion shall not preclude or diminish Owner's rights or remedies for Non-Compliant Work discovered after such events. All such rights and remedies set forth herein shall continue after such events.

2.5.3 Final Completion, Payment. Final Completion is the completion of all Work. When Contractor has completed all Work, it shall request an inspection for Final Completion. Design Professional shall inspect all Work and if it determines that all Work it complete, it shall execute the Certificate of Final Completion. Upon Final Completion, Contractor shall submit a Payment Application requesting the remainder of the Contract Sum. Acceptance of Payment for Final Completion by Contractor shall operate as settlement, waiver, release, discharge and payment in full of all claims against Owner of any nature arising out of the Project.

2.5.4 Effect of Achieving Final Completion. A determination that Contractor has achieved Final Completion, the issuance of a Certificate of Final Completion, or Owner's Payment for Final Completion shall not preclude or diminish Owner's rights or remedies for Non-Compliant Work discovered after such events. All such rights and remedies set forth herein shall continue after such events.

2.6 Payment

2.6.1 Schedule of Values. Prior to the issuance of the Proceed Order, Contractor shall submit a Schedule of Values of the Work to assist Design Professional in reviewing Payment Applications. The Schedule of Values shall allocate the Contract Sum to the portions of the Work in such detail as Owner or Design Professional require. If requested, Contractor shall provide evidence of the accuracy of the Schedule of Values. Unless objected to the Owner or Design Professional, the Schedule of Values shall be used to determine the payment due for completion of each portion of the Work.

2.6.2 Payment Applications. Contractor shall submit a Payment Application to the Owner and Design Professional by the fifth (5th) day of each month for the Work performed during the previous month on the form supplied by the Owner. The Payment Application shall itemize the total sum billed in the same format as the Schedule of Values and shall include the percentage complete for each item of Work. Contractor shall submit no more than one (1) Payment Application during each month. No payment shall become due to Contractor until a proper Payment Application is submitted.

2.6.3 Representations of Contractor. The Payment Application constitutes a representation by Contractor to Owner that (i) the quality of the Work covered by the application is in accordance with the Contract; (ii) Contractor is entitled to payment in the amount requested; (iii) all Work covered by any previously approved Payment Application, for which Contractor has been paid, is free and clear of liens, claims, security interests or encumbrances, and (iv) title to all Work covered by the Payment Application will pass to Owner no later than the time of payment.

2.6.4 Payment. The Owner shall make payment for all Work completed in the previous month, based upon the Schedule of Values and Contractor's estimate of percentage complete, as confirmed by the Design Professional, less the retainage pursuant to Section 2.6.10 and subject to Owner's right to withhold amounts in accordance with Section 2.6.7 and Owner's right to adjust for overpayments. Owner shall make payment to Contractor no later than thirty (30) days after receipt of a properly completed Payment Application.

2.6.5 Disputed Payments. Owner and Contractor agree to use their best efforts to resolve all disputes concerning the Payment Application during the said thirty (30) day payment period. If Owner disputes a portion of the Payment Application, Owner shall make payment of all undisputed amounts within the thirty (30) day payment period.

2.6.6 Late Payments and Interest. Should Owner fail to timely pay as required by Section 2.6.7, Contractor shall provide Notice to Owner in writing by certified mail. If Owner fails to pay within seven (7) days of receipt of the Notice, Contractor shall receive, in addition to the payment due, interest thereon at the rate of one-half percent (1/2%) per month. Pursuant to O.C.G.A. § 13-11-7(b), Owner and Contractor expressly agree to payment periods for Owner's Payment to Contractor and interest rates on late payments that become due to Contractor for late payment by Owner that are different than those set forth in O.C.G.A. § 13-11-4(a) and O.C.G.A. § 13-11-7(a). The payment periods and interest rates set forth herein shall control to the exclusion of any provisions set forth in the Georgia Prompt Pay Act, O.C.G.A. § 13-11-1, *et seq.*, and the provisions of said Act are waived.

2.6.7 Payments Withheld. Design Professional or Owner may withhold payment, or nullify the whole or part of any previous Payment Application, to such extent necessary to protect Owner from loss on account of any one or more of the following: (i) Non-Compliant Work; (ii) failure of Contractor to make payments due to Subcontractors; (iii) reasonable evidence that the Contract cannot be completed for the unpaid Contract Sum; (iv) damage to a Separate Contractor or to any other third party, or reasonable evidence that third parties may file claims against Owner due to acts or omissions of Contractor; (v) failure to maintain the Overall Project Schedule, or (vi) requests for or prior payment of costs that are not required to be reimbursed hereunder. When the grounds for withholding payment are remedied (if applicable), payment shall be made for amounts withheld because of them. In the case of withholding payment for failure to pay Subcontractors, Owner may agree to payment upon receipt of a satisfactory Consent of Surety.

2.6.8 Payment of Subcontractors. Contractor shall pay Subcontractors the amount due for Subcontractor's Work, less applicable retainage, within seven (7) days of receipt of payment from Owner for such Work unless the contract between Contractor and Subcontractor provides that no such payment is due (e.g. without limitation, as a result of non-performance under the Subcontract). The Owner has the right to request evidence from the Contractor that the Contractor has properly paid all Subcontractors. If the Contractor fails to provide such information within seven days

of Owner request, Owner shall have the right to contact Subcontractors to determine if they have been paid. Owner shall have no obligation to pay or see to the payment of money to a Subcontractor.

2.6.9 Payment Not Acceptance of Work. Neither payment by Owner nor any partial or entire use or occupancy of the Project shall constitute an acceptance of Work not in accordance with the Contract.

2.6.10 Retainage. Until the payment for Material Completion, Owner shall withhold retainage in the amount of five percent (5%) from each Payment Application, subject to the terms below.

2.6.10.1 Retainage Release. When Material Completion is achieved, retainage shall be paid to Contractor with the payment for Material Completion.

2.6.10.2 Subcontractor's Retainage Release. Upon request by Contractor, Owner may, in it is sole discretion, permit an amount equal to the retainage associated with a Subcontractor to be separately released from the retainage held by Owner upon completion of the Subcontractor's Work. To request Subcontractor retainage release, Contractor shall submit an original certificate executed by the Contractor and Subcontractor certifying that the Subcontractor's Work is complete, releasing of all claims by the Subcontractor, and stating the amount due to the Subcontractor.

3 FORMS

PERFORMANCE BOND
PAYMENT BOND
CHANGE ORDER TEMPLATE
CERTIFICATE OF MATERIAL COMPLETION
CERTIFICATE OF FINAL COMPLETION
PAYMENT AFFIDAVIT

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That **(Legal Name and Address of Contractor)** , as principal (hereinafter called the "Principal"), and **(Legal Title and Address of Surety),** as surety (hereinafter called the "Surety"), are held and firmly bound unto the **Georgia Department of Veterans Service** as Obligee (hereinafter called the "Owner"), in the amount of _____ DOLLARS ($ _____), the payment of which the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written agreement with the Owner dated _____ (hereinafter the "Contract") for construction of a project known as Georgia Veterans Memorial Cemetery Augusta, VSB-151-26-01; FAI GA-21-07 (hereinafter the "Project"), and such Contract is incorporated herein by reference;

NOW THEREFORE, the conditions of this obligation are as follows:

1. If the Principal shall completely and promptly perform each and all of the requirements of the Contract, including any warranties or guarantees required thereunder, and all modifications, amendments, changes, deletions, additions, and alterations thereto that may hereafter be made; and if the Principal and the Surety shall indemnify and hold harmless the Owner from any and all losses, liability, damages, claims judgements, liens, costs, and fees of every description, arising from the Project or under the Contract, whether imposed by law or equity, which may be caused by the failure or default of the Principal in the performance of the Contract, including all modifications, amendments, changes, deletions, additions, and alterations thereto and any warranties or guarantees required thereunder, then this obligation shall be void; otherwise this obligation shall remain in full force and effect.

2. In the event of the failure of performance of the Contract by the Principal, which shall include, but is not limited to, any breach or default of the Contract, the Surety, upon demand by the Owner, shall undertake and complete such required performance and cure any breach or default of the Contract. The Surety shall not assert any action or inaction of the Principal as justification for the Surety's failure to timely perform the obligations of this Bond.

    a. The Surety shall commence performance of its obligations and undertakings hereunder no later than thirty (30) days after receiving notice of the Principal's failure of performance. If the Surety fails to commence performance as required herein within such period of time, or if the Surety otherwise breaches its obligations to the Owner under this Bond and the Contract, the Surety shall be liable to the Owner for Owner's actual damages, including but not limited to all costs of litigation and attorneys' fees, plus any penalties as may be provided by law.

    b. The means, methods, or procedure by which the Surety undertakes to perform its obligations under this Bond shall be subject to the advance written approval of the Owner, such approval shall not be unreasonably withheld.

    c. If the Surety fails or refuses to perform as provided above, or if the Owner and the Surety cannot agree as to the means, methods, or procedure of performance by the Surety, the Owner shall have the right, through itself or others, to do all or any part of the remaining work to be performed by the Principal, and without limiting its other obligations hereunder, the Surety shall pay the Owner any losses or damages resulting therefrom.

3. The Surety hereby waives notice of any and all modifications, amendments, changes, deletions, additions, or alterations to the Contract, and agrees that the obligations arising under this Bond shall not be impaired in any manner by any reason of any such modifications, amendments, changes, deletions, additions, or alterations. The obligations arising under this Bond shall not be impaired by the Owner's performance of any work on the Project.

4. The Surety shall not assign or delegate any rights or obligations under this Bond without the written consent of the Owner, such consent shall not be unreasonably withheld.
5. The Surety agrees that the Owner may make inquiries at any time of any subcontractor, laborer, materialman, or any other party concerning the status of payments for labor, materials, or services furnished to or for the Project.

6. No right of action shall accrue on this Bond to or for the use of any person or corporation other than the Owner named herein or the legal successors of Owner.

7. For the purposes of this bond, notice shall be sent to the Surety at the following address:

   Name:

   Address:

   City: State: Zip Code:

8. This Performance Bond shall be governed by the laws of the State of Georgia, is furnished in accordance with O.C.G.A. §§ 13-10-40, and shall be subject to increase in the penal amount of the bond pursuant to such statute and the provisions of the Contract.

SIGNED AND SEALED THIS _____ DAY OF _____, 20_____.

ATTEST (Seal) (Name of Contractor)

_____ By_____

Secretary (Note 1) President

(Seal) (Name of Surety) (Note 2)

By: _____

(Title)

Resident Georgia Agent *

Note 1. Please apply seal of Corporation over Secretary's Signature.
Note 2. Please apply seal of Surety and arrange for countersignature by a "Resident Georgia Agent" of Surety in order to comply with surety regulations of Georgia.

(*) Attach Power of Attorney

STATUTORY PAYMENT BOND

That **(Legal Name and Address of Contractor)** as Principal (hereinafter referred to as the "Principal") and **(Legal Title and Address of Surety)** as Surety (hereinafter referred to as "Surety"), are held and firmly bound unto the **Georgia Department of Veterans Service** as Obligee (hereinafter referred to as "Owner") for the use and benefit of all subcontractors and all persons supplying labor, materials, machinery, or equipment to the Principal or a subcontractor for the Project (as hereinafter defined), in the amount of _____ DOLLARS ($_____) to which payment Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written agreement with the Owner dated _____ (hereinafter the "Contract") for construction of a project known as Georgia Veterans Memorial Cemetery Augusta, VSB-151-26-01; FAI GA-21-07 (hereinafter the "Project"), and such Contract is incorporated herein by reference;

NOW, THEREFORE, the conditions of this obligation are as follows:

1. If the Principal shall promptly pay in full every subcontractor and all persons supplying labor, materials, machinery, or equipment to the Principal or a subcontractor for the Project, then this obligation shall be void; otherwise it shall remain in full force and effect.

2. This Payment Bond is governed by the laws of the State of Georgia, is furnished in accordance with O.C.G.A. §§ 13-10-60 *et seq.*, shall be subject to increase in the penal sum of the bond pursuant to such statute and the provisions of the Contract, and is construed in accordance with applicable statutes.

3. The Surety hereby waives notice of any and all modifications, amendments, changes, deletions, additions, or alterations to the Contract, and agrees that the obligations arising under this Bond shall not be impaired in any manner by any reason of any such modifications, amendments, changes, deletions, additions, or alterations.

4. Every subcontractor or person who has not been paid in full for supplying labor, materials, machinery, or equipment to the Principal or a subcontractor for the Project before the expiration of a period of ninety (90) days after the day on which the last of the labor was done or performed by such person, or the material or machinery or equipment was furnished or supplied by such person for which claim is made, shall have the right to bring an action on this Payment Bond for the amount, or the balance thereof, unpaid at the time of the commencement of such action and to prosecute such action to final execution and judgment for the sum or sums due such person, subject to the requirements of O.C.G.A. §§ 13-10-63.

5. The Contractor and Surety agree that the Owner may make inquiries at any time of any subcontractor, laborer, materialman, or any other party concerning the status of payments for labor, materials, machinery, or equipment furnished to or for the Project.

6. For the purposes of this bond, notice shall be sent to the Surety at the following address:

   Name:

   Address:

   City: State: Zip Code:

SIGNED AND SEALED THIS _____ DAY OF _____, 20_____.

ATTEST **(Name of Contractor)**

_____ By)_____(Seal)
Secretary (Note 1) President

(Seal) **(Name of Surety)** (Note 2)

By _____(Seal)
(Title)
Resident Georgia Agent *

Note 1. Please apply seal of Corporation over Secretary's Signature. Otherwise "(Seal)" shall constitute such seal.
Note 2. Please apply seal of Surety. Otherwise "(Seal)" shall constitute such seal. Arrange for countersignature by a "Resident Georgia Agent" of Surety in order to comply with surety regulations of Georgia.

(*) Attach Power of Attorney

CHANGE ORDER

Owner:	
Project Name:	
Date:	
Change Order #:	

This Change Order is executed to change the terms of the Contract for the above listed Project. Owner and Contractor agree as follows:

1. The Construction Professional shall perform the following Work:

   The following documents are attached to this Change Order to further describe the scope of the change in the Work that is authorized:

2. The Contractor shall be allowed _____ additional calendar days to reach Material Completion because of this Change Order**.** The new Material Completion Date is _____.

3. The Contract Sum shall be changed by _____ on account of this Change Order. The Construction Professional affirms that the quantities and pricing submitted are accurate and do not exceed actual requirements and that that all prices are fair and equitable and do not exceed current costs for like services or materials.

4. The change in Contract Time and Contract Sum (if any) provided by this Change Order constitutes compensation in full to Contractor for the Change Order Work and accounts for all delays and impacts related thereto.

5. **Proceed Order:** The Construction Professional is authorized to proceed with the Change Order Work as of _____.

RECOMMENDED FOR OWNER'S ACCEPTANCE

Desgin Professional:

By_____

Name: _____

ACCEPTED AND AGREED:

Owner:	**Contractor:**
By:_____	**By:** _____
Name:_____	**Name:** _____

CERTIFICATE OF MATERIAL COMPLETION

Project Number and Name: Georgia Veterans Memorial Cemetery Augusta, VSB-151-26-01; FAI GA-21-07

Contractor:

Design Professional: 2KM Architects, Inc.

The Design Professional issues this Certificate of Material Completion of the Project and certifies as follows. Any exceptions shall be identified and explained in Paragraph 8 below:

1. The Design Professional, having conducted inspections of the Project, has determined that all Work required by the Contract Documents has been completed in accordance with the Contract Documents with the exception of items shown on the attached draft of the Final Punch List.

2. The attached draft of the Final Punch List specifies items that constitute either a Minor Item or Permitted Incomplete Work. Within five days of the execution of this Certificate of Material Completion, a Final Punchlist shall be issued which shall include the amounts to be withheld for each Minor Item and Permitted Incomplete Work and a required completion date for each.

3. There are no outstanding Notices of Non-Compliant Work which are not included on the Final Punch List.

4. All tests and inspections required by the Contract Documents have been performed and were reviewed by a registered architect or registered engineer of the Design Professional.

5. No Work has been certified for payment that was covered prior to consent of the Design Professional.

6. The State Fire Marshal has issued a Certificate (or Temporary Certificate) of Occupancy if required for this Project.

7. There are no pending Change Orders resulting in credits due to the Owner.

8. Exceptions (State Paragraph reference and explanation): _____

This Certificate is executed by the Design Professional this _____ day of _____, 20__.

(Name of Design Professional Firm)

By: _____ _____ ___

(License Number and State)

Printed Name:_____
Title: _____

CERTIFICATE OF FINAL COMPLETION

Project Number and Name: Georgia Veterans Memorial Cemetery Augusta, VSB-151-26-01; FAI GA-21-07

Contractor:

Design Professional: 2KM Architects, Inc.

The Design Professional issues this Certificate of Final Completion of the Project and certifies as follows.

1. The Design Professional, having conducted observations and evaluations of the Project, has determined that all Work required by the Contract Documents has been completed in accordance with the Contract Documents.

2. There are no outstanding Notices of Non-Compliant Work.

3. All tests and inspections required by the Contract Documents have been performed and were reviewed by a registered architect or registered engineer of the Design Professional.

4. No Work has been certified for payment that was covered prior to consent of the Design Professional.

5. The State Fire Marshal has issued a Certificate of Occupancy (if required for the Project).

6. There are no pending Change Orders resulting in credits due to the Owner.

This Certificate is executed by the Design Professional this day of .

(Name of Design Professional Firm)

By: _____

(License Number and State)

Printed Name:
Title:

PAYMENT AFFIDAVIT

Project Number and Name: Georgia Veterans Memorial Cemetery Augusta, VSB-151-26-01; FAI GA-21-07

Contractor:

Design Professional: 2KM Architects, Inc.

STATE OF GEORGIA;
COUNTY OF

KNOW ALL MEN BY THESE PRESENTS:
Pursuant to the Contract between Contractor and the Owner for the Project noted above, the Contractor certifies as follows:

1. All Work required under the Contract has been performed in accordance with the terms thereof except as listed on attached Schedule A. ☐ *Check if Schedule A is attached*

2. Contractor has paid for all Work covered by previous Payment Applications, paid all Subcontractors for Work covered by previous Payment Applications, and no Subcontractors have made claims for past due payment except as listed on attached Schedule B. ☐ *Check if Schedule B is attached*

3. The Contractor has no outstanding claims against the Owner of any character, including disputed claims, arising out of the performance of the Contract except as listed on attached Schedule C. ☐ *Check if Schedule C is attached*

4. To the best of its knowledge and belief there are no unsatisfied claims for damages resulting from injury or death to any employees, Subcontractors, or the public at large arising out of the performance of the Contract, or any suits or claims for any other damage of any kind, nature, or description except as listed on attached Schedule D. ☐ *Check if Schedule D is attached*

5. There has been no exertion or attempted exertion of any influence by any employee, officer, or agent of the Owner, or any person connected with the State Government of Georgia, on the Contractor in the purchase of materials, equipment, or other items involved in construction, manufacture, or employment of labor under the aforesaid Agreement.

The undersigned makes this affidavit for the purpose of receiving payment for Material Completion, a Retainage Release, or in the case of Final Payment, for full settlement of all claims against the Owner arising under or by virtue of the Construction Agreement except as stated above. Acceptance of such payment is acknowledged as a release of the Owner from any and all claims arising under or by virtue of the Agreement except as stated above.

This Affidavit is executed by the Contractor this (Day) day of (Month), (Year).
(Insert Name of Construction Firm)

By: _____, (Name and Title of Signatory)

SUBSCRIBED AND SWORN
BEFORE ME ON THIS THE

_____ DAY OF _____, 20_

_____ [NOTARY SEAL]
Notary Public
My Commission Expires: _____

4 CONTRACT SUPPLEMETARY GENERAL REQUIREMENTS

SECTION D
SUPPLEMENTARY GENERAL CONDITIONS

D-01 CHANGES IN THE WORK

A. Changes in the Work. Amend by the addition of the following sub-paragraph:

1. *Owner's Right to Make Changes.* The Owner, without invalidating the Contract, may order Changes in the Work consisting of additions, deletions, or modifications, the Contract Sum and the Contract Time being adjusted accordingly. The Contractor hereby expressly agrees that the Contractor shall have no right to a claim for damages or extended overhead because of changes made by the Owner. Such work is hereinafter designated "change" or "changes." All such changes shall be performed under the conditions of the original contract except that any claim for extension of time caused thereby shall be adjusted at the time of signing of the change order form. All such changes in the Work shall be authorized only by written Change Order in total lump sum signed by the Owner and Veterans Cemetery Grant Program **VCGP**. (A sample change order form is provided in Forms Section, however, the exact form to be used may differ and may be provided by the Design Professional or the Owner.)

2. The change order form shall be accompanied by a breakdown in the form prescribed in a specimen which the Owner will supply to any bidder upon request. The Design Professional shall certify to the amount of the adjustment. The change order form shall be signed by the Design Professional, the Contractor, the Owner, and Veterans Cemetery Grant Program **VCGP** prior to releasing the Contractor to proceed. The breakdown is only for the purpose of enabling the Design Professional and the Owner to make a judgment on the dollar amount of the adjustment in the contract sum. In the event any condition, term, qualification, limitation, exception, exemption, modification, or proviso shall appear in a breakdown it shall be invalid unless expressly recited in the change order form under Paragraph 3, "Description of Change."

3. Cost to Owner for Change. The cost or credit to the Owner from a change in the Work shall be determined in one or more of the following ways:
   Case 1. By estimate and acceptance of a lump sum.
   Case 2. By Unit Prices named in the Contract or subsequently agreed upon. Unit Prices are NET and include all compensation due the Contractor.
   Case 3. By force account, which is defined as expenditures allowed under this Article plus a percentage of percentages as stated hereinafter. [see paragraph (7) below]

4. Changes Forbidden without Consent of Owner. Neither the Design Professional nor the Contractor shall make any change whatsoever in the work without authorization or order of the Owner and VCGP in writing except in emergency. The Contract Sum and the Contract Time may be changed only by written Change Order.

5. Existing Conditions. By executing the Contract, the Contractor represents that he has visited the site and familiarized himself with the local conditions under which the Work is to be performed. The Owner does not undertake to represent or warrant site or local conditions.

6. Cost to Owner, Allowances for Contractor and Allowable Expenditures. In cases (1) and (3) above, the "allowance for overhead and profit" combined, included in the total cost to the Owner, shall be based upon the following schedule:
   a. For the Contractor an allowance for work which he performs with his own forces, not to exceed 20% of his "net additional allowable expenditures", if any, for changes.
   b. For a subcontractor an allowance for work which he performs with his own forces, not to exceed 20% of his "net additional allowable expenditures", if any, for changes. A subcontractor shall receive no allowance for overhead and profit on work not performed by his own forces.
   c. For the Contractor an allowance for work performed by his subcontractors, not to exceed 7 1/2% of the amount, if any, due the subcontractor for changes.

The above percentages shall be applied to the "net allowable expenditures" if any, as limited and defined herein. If the net difference between "allowable expenditures" and savings results in a decrease in expenditures, the amount of credit allowed the Owner shall be the net decrease without and credit for profit and overhead. "Net additional allowable expenditures" as used herein shall mean the difference between all "allowable expenditures" and savings. The term "allowable expenditures" is limited to and defined as items of labor or materials, the use of heavy construction equipment and all such items of cost as insurance premiums, social security and old age and unemployment insurance, and (in cases where there is an extension of time) pro rata expenditures for time of foreman employed in the direct superintendence of productive labor in execution of changes. All expenditures not included in the term "allowable expenditures" as limited and defined in this article shall be considered as overhead, including but not limited to insurance other than that which is mentioned in this article, bond premiums, supervision, travel (meals, transportation and lodging), superintendence (except pro rata time of foremen as referred to herein), timekeepers, clerks, watchmen, hand tools, small tools, incidental job burdens and office expense. Any other provisions in the Contract Documents to the contrary notwithstanding, only demonstratable, direct, out-of-pocket expenditures for the changes plus percentages as set forth hereinabove shall be allowable for changes. The Contractor shall provide to the Owner, upon request, any and all necessary information the Owner may require in order to verify any and all costs associated with "Changes in the Work."

7. Breakdown of Expenditures, Cases (1) and (3). To accompany all change orders, the Contractor shall furnish a breakdown of expenditures for labor and materials by units and quantities in the form prescribed by the Owner, and the breakdown shall be accompanied by the following declaration.

   "I do solemnly swear to the best of my knowledge, information, and belief, that the costs shown hereinabove do not exceed current costs for like services or materials in the locality of the Project and, in the case of a Force Account, the costs represented do not exceed the actual costs to the Contractor; and that the quantities shown do not exceed actual requirements."

   For all force account changes the Contractor shall promptly and in no event later than thirty (30) days after receipt of written demand therefore pursuant submit to the Design Professional a complete, accurate, and final breakdown and account together with vouchers, showing all expenditures and percentages allowable under Case (3). For all unit price changes the Contractor shall promptly and in no event later than thirty (30) days after receipt of written demand therefore submit to the Design Professional an accurate account of the quantity of work performed under Case (2). In any case, the Design Professional shall certify to the amount [including under Case (1) and Case (3) the allowance prescribed in the contract for overhead and profit] due the Contractor. The Contractor shall obtain and furnish as backup to the Contractor's breakdown a separate breakdown for each subcontractor's charges prepared by each subcontractor on the letterhead of the subcontractor and properly signed by the subcontractor.

   Force account changes are not acceptable to VCGP and must be resolved to fixed lump sum Change Order execution to qualify for federal VCGP funding.

8. Time of Submission of Claims ["Statement of Claim"]. Budgeting and cash flow being of material importance to the Owner, no claim of the Contractor on account of any change or on account of any alleged negligence of the Design Professional or Owner whether said claim shall be accrued or prospective, shall be valid unless a "statement of claim" in full accompanied by vouchers and other supporting data shall have been filed with the Owner by the Contractor not later than thirty (30) days after receipt of written request thereof by the Contractor from the Owner, time being of the essence. The "statement of claim" shall contain a concise and clear recital of the ground or grounds on the basis of which the claim is asserted, including a designation of the provision or provisions of the contract documents on which the claim is based. The statement of claim shall indicate the dollar amount of the claim.

D-02 PAYMENTS

A. The Contractor shall submit to the Architect a schedule of values of the various portions of the work, quantities aggregating the total Contract Sum, divided so as to facilitate payments to Sub-contractors. Each item in the schedule of values shall include its proper share of overhead and profit. This schedule, when approved by the Architect, shall be used only as a basis for the Contractor's Application for Payment.

B. Payment request shall be submitted to the Architect in electronic pdf and two (2) copy form (original plus two (2) copies all bearing original signatures in blue ink).

D-03 PROGRESS SCHEDULE

A. Within 10 days after date of written "Notice to Proceed", the Contractor shall furnish to the Owner via the Architect a Construction Progress Schedule. The Progress Schedule shall be related to the entire Project to the extent required by the Contract Documents. This schedule shall indicate the dates for the starting and completion of the various stages of construction and shall be revised as required by the conditions of the Work, subject to the Architect's approval.

B. Schedule updates shall be issues (3) days in advance of bi-weekly & monthly Owner/Architect/Contractor meetings.

D-04 CONTRACT GENERAL REQUIREMENTS

A. Contract General Requirements and Exhibits, Paragraph 2.3.2.2 referencing Fire Marshal's Inspection of Work. Fire Marshal review is only applicable for projected interior work.

D-05 ACTS AND EXECUTIVE ORDERS

A. The Contractor, by signing the contract, acknowledges that he is aware of and familiar with the contents and requirements of the following acts and executive orders:

1. High Voltage Act - Georgia Law 1960, PP. 181-183.
2. Underground Gas Pipe Law - Georgia Law 1969, PP. 50-57.
3. Williams Stieger Occupational Safety and Health Act of 1970.
4. The non-discrimination clause contained in Section 202 Executive Order 11246 as amended by Executive Order 11375 relative to Equal Employment Opportunity for all persons without regard to race, color, religion, sex, or national origin and the implementing rules and regulations described by the Secretary of Labor are incorporated.

D-06 MISCELLANEOUS APPLICABLE LAW

A. Contractor shall comply with all laws, rules, regulations, ordinances and orders of any government agency having jurisdiction in the performance of the work. Without limitation of the foregoing, the following laws are specifically referenced:

1. Preference for Georgia supplies, materials, equipment, and agricultural products, O.C.G.A. §§50-5-60 through 61, superseded by Federal Requirements. See item 11.
2. Preference for Georgia forest products, O.C.G.A. §50-5-63, superseded by Federal Requirements. See item 11.
3. Preference to local sellers of Georgia products, O.C.G.A. §50-5-62, superseded by Federal Requirements. See item 11.
4. Providing safe workplace, O.C.G.A. §§34-2-10 and 34-7-20.
5. Small and Minority Business Enterprises, O.C.G.A. §§50-5-120 et seq. and 50-5-130 et seq.
6. Title VII of the Civil Rights Act. 42 U.S.C. §§2000a through 2000h-6.
7. Age Discrimination Act, 29 U.S.C. §621 et seq.; USC §6101 et seq.
8. Americans with Disabilities Act, 42 U.S.C. §12101 et seq.
9. Federal Occupational Safety and Health Act, 29 U.S.C. §§651 et seq.
10. Federal Emergency Planning and Community Right-to-know Act, 42 U.S.C. §11001.
11. Infrastructure Investment and Jobs Act, Pub. L. No. 117-58 which includes Build America, Buy America Act, Pub. L. No. 117-5 §§7090152. See E-15.

D-07 OSHA, EPA & EPD REGULATIONS

A. Every safety precaution shall be taken during all stages of construction. All OSHA, EPA and EPD Safety and Health requirements shall be adhered to.

D-08 CONTRACTOR EMPLOYEES CONDUCT

A. The Contractor shall ensure that his employees and his subcontractors employees conduct themselves in a gentlemanly manner while on the Georgia Department of Veterans Service GVMC campus. Gestures, remarks, cat calls, whistling, or anything else of a derogatory nature will not be tolerated, and will be sufficient cause for the permanent removal of an employee from the campus.

D-09 TEMPORARY UTILITIES

A. Arrange and coordinate connection of temporary utilities with Architect and GVMC c/o the Georgia Department of Veterans Service.

B. Temporary Power - Contractor shall obtain temporary power for construction from an existing power distribution system. Extend temporary power for construction activities and pay for all associated distribution costs.

C. Temporary Water – Contractor shall use existing water utility and extend piping and hoses. Remove & restore systems upon completion of work. Conform to Augusta-Richmond County Water Dept. requirements.

D. Provide temporary toilets, service, maintain & remove & sanitize per County & State Health Dept. requirements.

D-10 INTERRUPTION OF UTILITIES

A. Work shall be scheduled to avoid as much as possible interference with the normal operation of the adjacent Campus. Chris Lehi, Senior Contract Administrator, 2KM Architects, Inc. must be notified in advance for approval of utility shut-downs, tie-ins & extensions.

D-11 EXISTING FACILITIES TO BE KEPT IN OPERATION

N/A

D-12 CONSTRUCTION

A. Contractor shall request approval from the Owner telephone number (912) 654-5398, regarding access to area at least 48 hours prior to commencing work. Contractor shall submit anticipated schedule in writing indicating dates of access to area required to complete work in accordance with contract documents.

B. Construction limits shall be the area of construction as shown on site plan. All construction activities must be limited to this area, except as modified by contract documents. Access to site, delivery of materials, and material storage areas indicated outside of construction limits shall be pre-approved by the Architect and GVMC/Owner.

C. Delivery Route - Materials and equipment must approach site from public roads to Service drive indicated on drawings.

1. Large vehicles may require flagmen and safety provisions. (Augusta-Richmond County right-of-way)

D. Parking - The Contractor will be allowed parking in open areas on site. Permission for parking outside construction limits shall be obtained from the GVMC Director.

D-13 STORAGE

A. Contractor's storage area for materials shall be limited to the area of construction and limits of construction. Requests for use of any area outside construction limits must be made by the Contractor in writing to the Owner via Architect. Requests must indicate limits of area requested and time area will be needed.

D-14 MATERIALS AND PRODUCTS CONTAINING ASBESTOS

A. The use of asbestos in any product incorporated within these specifications by any Contractor, Subcontractor, Manufacturer or material supplier is prohibited.

B. It is the intention of the Architect not to specify, approve or use any material that contains asbestos in any form. If materials included in these specifications contain asbestos, it shall be interpreted to be unknown to Architect. The Contractor, subcontractors, material suppliers and manufacturers shall notify Owner and Architect of materials containing asbestos and shall not supply or incorporate such materials in this project. If installed by the Contractor, it will be removed at the Contractor's expense.

D-15 DISPOSAL OF EXISTING MATERIALS

A. Existing work removed but not reused in this project and scheduled for "salvage" shall be delivered to and turned over to the Georgia Department of Veterans Service GVMC, Augusta, c/o Cemetery Director by the Contractor in their preconstruction inspection condition.

B. Demolished materials shall be removed from site and legally disposed.

D-16 TRASH DISPOSAL

A. Contractor shall allow no trash to accumulate and shall remove same from work areas at close of each working day. All debris shall be disposed of off campus. Burning of material on site will not be permitted.

B. Contractor shall pay all costs & fees for disposal.

C. Contractor shall provide name & location of licensed waste disposal site to the Owner.

D. All waste removed form the site shall be containerized and removed as solid waste unless properly cleaned for recycling and approved by the Owner. All materials shall be transported and disposed at an approved landfill. Any landfill used for C&D waste shall also be approved prior to removal of materials from the site. No other disposal site shall be allowed.

E. Local Ordinances: It is the responsibility of the collector to comply with all local rules, regulations, and ordinances pertaining to operation of solid waste collection systems.

F. The contractor shall provide to Architects, on behalf of, Georgia Veterans Memorial Cemetery all solid waste tipping fee receipts from the landfill(s).

D-17 PROTECTION OF PROPERTY

A. Contractor is responsible for locating and protecting all public and private underground utilities. Private utilities include electrical, sanitary sewer, storm sewer, water, gas, and steam. Location of private utilities shall be done by a combination of field detection devices, and review of record drawings, and private locate service paid by Contractor.

B. Contractor will be held liable for all damages to personal and real property as a result of his negligence to provide protective measures.

C. The construction of the safeguards shall be in accordance with NFPA 241 Standard for Safeguarding Construction, Alternation and Demolition Operation, 2022 Edition.

D. When the need for protection installed no longer exists, the Contractor shall remove such protective devices.

E. Contractor shall install and maintain enclosure fencing and pay all rental fees & cost of removal at end of Contract.

D-18 FLAMMABLE STORAGE CONTAINERS

A. Any and all flammable materials (lacquer, thinner, gasoline, etc.) to be used on the project shall be stored in five (5) gallon explosion-proof containers.

D-19 SUBMITTALS

A. All submittals made to the architect shall be electronic.

B. Submittals are requested and checked by Architect to assist Contractor in confirming compliance with contract documents and shall be accepted by Architect subject to the following conditions. The following is a list of pre-work and final submittals:

1. Schedule of Values
2. Project Schedule with time line
3. Proposed Landfill Site
4. Detailed Plan of Work.
5. Submittals required in Section 01 33 00 "Submittals" (electronic PDF & submit (2) copies bound, cataloged, and tabbed)

C. See Technical Specification Sections and Section 01 33 00 "Submittals" for additional submittal requirements.

D-20 CONSTRUCTION BARRIERS

A. Provide protective barriers to enclose the work area. Protect public from hazard and prevent unauthorized access to construction area.

B. Remove upon completion of the work & restore finished work.

D-21 CONSTRUCTION/CONTRACTORS REQUIREMENT

A. Construction employers will not knowingly allow person(s) who have outstanding criminal warrants to work on campus.

B. All contractors who employ work release persons as employees are to furnish the Georgia Department of Veterans Service with all names of such persons employed under the Work Release Program.

C. All contractors are to provide the Georgia Department of Veterans Service with a list of supervisors in charge of the construction along with telephone numbers & emergency contact information.

D. Contractors and employees are to obey all laws, as well as the rules of the Georgia Veterans Memorial Cemetery when they are on State property.

E. Contractors, employees, sub-contractors and workers are to have a government issued photo ID on their person at all times.

F. All Contractor employees shall be fully clothed and have all proper safety equipment.

D-22 KEY SUBCONTRACTORS

A. The key Subcontractors are required to be listed on the General Contractor Subcontractor Listing (see attached Form No. D-2) at the time of submission of List of Subcontractors. The General Contractor will not be allowed to make any substitutions subsequent to submittal of the List of Subcontractors without the express written consent of the Owner. If the work will not be sub-contracted, the General Contractor should be listed on this form and a Qualification Affidavit included where stipulated for the General Contractor's credential for the work covered.

B. The General Contractor must require a 100% Payment and Performance Bond of these subcontractors. The subcontractor's Payment and Performance Bond must comply with the requirements of Article 1.2 of Contract General Requirements except that the Obligee shall be shown to be the General Contractor.

C. If so indicated on Form No. D-2, the General Contractor must submit the attached Subcontractor Qualification Affidavit form (see attached Form No. D-3) for each key subcontractor so designated. This Affidavit must be submitted by the General Contractor at the time of submission of the List of Subcontractors. The affidavit form must be filled out by the General Contractor, signed by an Officer of the company, and notarized. Submission of this Affidavit is a contract requirement and, by its demand, the Owner does not waive nor prejudice his right of demand for post bid certifications or affidavits as required elsewhere in the contract specifications.

D-23 ALLOWANCES See Section 01 21 00 "Allowances"

D-24 UNIT PRICES See Bid Form and Section 01 23 00 "Alternates".

D-25 INCLEMENT WEATHER

TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER

(A) This provision specifies the procedure for the determination of time extensions for unusually severe weather in accordance with Section 1.4 Time of the Contract General Requirements. This listing below defines the monthly-anticipated adverse weather days for the contract period, is based upon weather days for the contract period, and is based upon NOAA (National Oceanic and Atmospheric Administration), NWS (National Weather Service), or similar data for the geographic location of the project.

MONTHLY ANTICIPATED ACTUAL ADVERSE WEATHER (CALENDAR DAYS)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	4	4	4	4	3	4	3	3	2	3	4

(B) The above schedule of anticipated adverse weather days shall constitute the base line for monthly (or portion thereof) weather time evaluations. Upon acknowledgement of the Proceed Order and continuing throughout the contract on a monthly basis, the Contractor shall record actual adverse weather days at the work site on a calendar day basis (including scheduled workdays on weekend and holidays) and compare the actual adverse weather days to the monthly-anticipated adverse weather days listed above. For purposes of this subparagraph, the term "actual adverse weather days" shall only include days the work was impacted by adverse weather. Adverse weather occurring on a day which is not a scheduled workday will not be considered an actual adverse weather day.

(C) The number of actual adverse weather days shall be measured chronologically from the first to the last day in each month. Once the number of actual adverse weather days anticipated in paragraph "A" above has occurred, the Architect will examine any subsequently occurring adverse weather days to determine whether the Contractor is entitled to a time extension. The Contractor's construction schedule must reflect the above-anticipated adverse weather delays on all weather dependent activities.

(D) Prior to claiming an actual adverse weather day, the Contractor must show he has taken steps to mitigate the effects of unusually severe weather.

D-26 IMPLEMENTATION OF THE NPDES RULES AND REGULATIONS

A. Projects of One Acre or More

Notice: Consult with Georgia Environmental Protection Division of the Georgia Department of Natural Resources for the latest NPDES responsibilities. The Contractor shall be responsible for meeting all NPDES requirements, including, but not limited to, permitting, testing, and monitoring for the duration of the construction contract.

B. Project will result in an area greater than 1 acre of disturbed area.

D-27 SEXUAL HARRASSMENT PREVENTION POLICY – GEORGIA DEPARTMENT OF VETERANS SERVICE & STATE OF GEORGIA

A. The current sexual harassment policy can be found at the following location: http://doas.ga.gov/human-resources-administration/board-rules-policy-and-compliance/jointly-issued-statewide-policies/sexual-harassment-prevention-policy?utm_source=SPD+Procurement+Professionals&utm_campaign=7340666acd-EMAIL_CAMPAIGN_2017_09_27_COPY_01&utm_medium=email&utm_term=0_2eeb214ceb-7340666acd-10197909

B. Please see the current Statewide Sexual Harassment Prevention Policy Memorandum (Pages-1-7) issued by the Department of Administrative Services; Office of the Inspector General.

D-28 PROJECT TERMINOLOGY

A. Georgia Department of Veterans Service (GDVS) is the Veterans Affairs (VA) "Grant Recipient".

B. Georgia Veterans Memorial Cemetery (GVMC) is the GDVS Facility Receiving actual work involved in the VA Grant.

C. Veterans Cemetery Grant Program (VCGP) is a Division of Department of Veterans Affairs and is the Grant Funding Agency.

D. 2KM Architects, Inc. is the Design Professional responsible for the Contract Documents, Contract Administration and all communication with above entities.

This portion intentionally left blank

FORM NO. D-2
GENERAL CONTRACTOR'S SUBCONTRACTOR LISTING
PROJECT NO. VSB-151-26-01; FAI# GA-21-07

Division_____

Subcontractor Name_____

Subcontractor Address_____

Subcontractor Qualification Affidavit Form D-3 is required.

FORM NO. D-3

INDIVIDUAL SUBCONTRACTOR QUALIFICATION AFFIDAVIT
(To be subscribed and sworn to before a notary public)

LISTED SUBCONTRACTOR DIVISION:_____

AFFIDAVIT

1. THIS IS TO CERTIFY that_____(subcontractor's company name), proposed subcontractor for_____ (scope of work) for Project No._____is qualified for the work of the above Division(s) and meet the qualifications cited in Specification Section(s)_____, Paragraph(s)_____.

2. THE CERTIFICATIONS of the affiant are not mere declarations, but are in consideration of and in fulfillment of express contractual requirements established in the bidding documents for this project.

3. THIS AFFIDAVIT applies to Project No. **PROJECT NO. VSB-151-26-01; FAI# GA-21-07 GVMC Augusta.**

This_____ day of _____, 2012.

General Contractor:_____

By:_____

Title (must be an Officer of the company)_____

CERTIFICATE OF NOTARY PUBLIC

Sworn and subscribed to before me, an Officer authorized to administer oaths.

This_____ day of _____, 20_____.

_____
Notary Public

My commission expires on _____

Seal

REQUEST FOR PRIOR APPROVAL

Date of Request_____ Job Bid Date_____

Name of Party Proposing Substitute:

Project No:

Specification Section and Paragraph:

Specified item:

Proposed Substitute:

Manufacturer:

Deviations from the Specified Item:

Manufacturer's Recommendations for use and installation:
(List recommendations)

Change in Other Work to permit Use of proposed Substitute:
(List changes. Submit drawings if required for clarity.)

Technical Data to Support Request for Approval:
(List ASTM designations met, submit testing laboratory reports and experience records.)

Certificate of Buy America, Build America Act (BABAA) Compliance:
(Manufactured Product Certification Letter on Manufacturer's Letterhead)

Other Supporting Data:
(Submit brochures, samples, drawings.)

POLICY **MEMORANDUM**

SUBJECT: Statewide Sexual Harassment Prevention Policy	**EFFECTIVE:** March 1, 2019
ISSUED BY: DEPARTMENT OF ADMINISTRATIVE SERVICES OFFICE OF THE STATE INSPECTOR GENERAL	

I. Introduction

While there are multiple types of workplace harassment, as Executive Order 01.14.19.02 recognizes, incidents of sexual harassment present unique challenges which warrant special emphasis and the implementation of a particularized approach to the prevention, detection and elimination of sexual harassment from the State workplace.

II. Purpose

The State of Georgia promotes respect and dignity and does not tolerate sexual harassment in the workplace. The State is committed to providing a workplace and environment free from sexual harassment for its employees and for all persons who interact with state government. All State of Georgia employees are expected and required to interact with all persons including other employees, contractors, and customers in a professional manner that contributes to a respectful work environment free from sexual harassment.

This Policy is intended to set standards for Executive Branch agencies and employees in furtherance of this commitment and to protect individuals from sexual harassment and retaliation.

III. Authority

Executive Order 01.14.19.02 directs the Georgia Department of Administrative Services Human Resources Administration Division (HRA), in consultation with the Executive Counsel to the Governor, to promulgate a uniform sexual harassment prevention policy that shall apply to all Executive Branch agencies.

In addition, pursuant to O.C.G.A § 45-20-4, the Georgia Department of Administrative Services is responsible for ensuring compliance with all applicable federal and state statutes and regulations concerning personnel administration and related matters. This includes, but is not limited to, the Equal Protection Clause of the Fourteenth Amendment of the United States Constitution, U.S. Const. amend. XIV., the Equal Protection Clause of the Georgia Constitution, Ga. Const. Art. 1, Sec. I, Para. II., Title VII of the Civil Rights Act of 1964, 42 U.S.C. §§ 2000e, et seq., and the Fair

Employment Practices Act of 1978, O.C.G.A §§ 45-19-20, et seq., which prohibit employment discrimination and harassment on the basis of sex.

IV. Applicability

The provisions of this Policy apply to all Executive Branch agencies. This Policy does not apply to the Board of Regents of the University System of Georgia, the Legislative Branch, or the Judicial Branch.

V. Definitions

For purposes of this Policy, the following definitions apply:

(a) "Agency" or "Agencies" means any Executive Branch agency, authority, board, bureau, commission, council, department, office, unit, entity, or instrumentality of any kind, and others as may be designated by the Governor, or to the extent that such designation does not conflict with state law.

(b) "Employee" is a person who is hired to provide services to the State on a regular basis in exchange for compensation and who does not provide these services as part of an independent business. "Covered Employee" is a person who is hired to provide services to an Agency on a regular basis in exchange for compensation and who does not provide these services as part of an independent business.

(c) "Investigator" is a person designated by his or her Agency head to conduct investigations related to sexual harassment complaints or reports.

(d) "Retaliation" is an act or omission intended to, or having the reasonably foreseeable effect of, punishing or otherwise negatively impacting an individual for submitting (or assisting with submitting) a complaint of or reporting sexual harassment, for participating in a sexual harassment investigation or proceeding, or for otherwise opposing sexual harassment.

(e) "Sexual harassment" is physical, verbal, or non-verbal/visual conduct that is either (i) directed toward an individual or (ii) reasonably offensive to an individual because of his or her sex. Therefore, for purpose of this Policy, "Sexual harassment" includes physical, verbal, or non-verbal/visual conduct constituting:

1. Unwanted sexual attention, sexual advances, requests for sexual favors, sexually explicit comments, and other conduct of an expressed or obviously implied sexual nature, by an individual who knows, or reasonably should know, that such conduct is unwanted and offensive; and

2. Conduct that is hostile, threatening, derogatory, demeaning, or abusive or intended to insult, embarrass, belittle, or humiliate an individual *because of his or her sex* – regardless of whether the underlying reason for the conduct is apparent.

This Policy purposefully prohibits all sexual harassment and is not limited to conduct that would rise to the level of unlawful conduct under state or federal anti-harassment laws.

(f) "Supervisor" or "Manager" is a Covered Employee who has the authority to oversee, hire, fire, demote, or to effectively recommend hiring, firing, or demotion, or to make or effectively recommend other material changes to the working conditions of at least one employee.

VI. Prohibited Conduct

(a) All Covered Employees are strictly prohibited from engaging in sexual harassment as defined herein. This prohibition applies to conduct occurring in or otherwise affecting the workplace. As such, it includes conduct occurring both on and off the work premises and during or outside of work hours. While sexual harassment encompasses a wide range of conduct, some examples of conduct specifically prohibited by this Policy include, but are not limited to:

1. Denying (directly or indirectly) an employment benefit or employment-related opportunity to an employee for refusing to comply with a sexually-oriented request;
2. Threatening (directly or indirectly) to deny an employment benefit or an employment-related opportunity to an employee for refusing to comply with a sexually-oriented request;
3. Providing or promising (directly or indirectly) to provide an employment benefit or employment-related opportunity to an employee in exchange for complying with a sexually-oriented request;
4. Engaging in sexually-explicit or suggestive physical contact, including touching another employee in a way that is unwelcome or restricting an employee's movement;
5. Displaying or transmitting pornographic or sexually-oriented materials (such as photographs, posters, cartoons, drawings, or other images) or storing or accessing such materials on State-owned equipment for personal use or consumption;
6. Engaging in indecent exposure;
7. Making obscene gestures (i.e., hand or bodily gestures);
8. Making romantic advances and persisting despite rejection of the advances;
9. Using sexually-oriented language or making sexually-related propositions, jokes, or remarks, including graphic verbal commentary about an individual's body or clothing; and,

10. Sending sexually suggestive or obscene messages by mail, in person, by telephone, or by electronic communication.

(b) Agencies and Covered Employees are further prohibited from engaging in retaliation against an employee for submitting (or assisting with submitting) a complaint of or reporting sexual harassment, for participating in a sexual harassment investigation or proceeding, or for otherwise opposing sexual harassment.

(c) A Covered Employee found to have engaged in sexual harassment and/or retaliation in violation of this Policy will be subject to corrective and/or disciplinary action, up to and including termination of employment.

(d) A third party found to have engaged in sexual harassment and/or retaliation may be subject to appropriate corrective action. Such action may include, but is not limited to, termination of contract, removal from Agency premises, restricted access to Agency premises and/or personnel, or notification to the third party's employer.

(e) Agencies shall immediately refer any reported criminal conduct the appropriate law enforcement agency. Such referral shall not prohibit an Agency from pursing its own investigation of the complaint or report. If criminal activity is suspected the Agency shall confer with the Office of the State Inspector General (OIG) regarding how to proceed with the Agency investigation.

VII. Training

(a) Agencies shall require all Covered Employees, including part-time, temporary, seasonal employees, and independent contractors who are regularly on Agency premises and/or regularly interact with Agency personnel to complete employee sexual harassment prevention training on an annual basis. An independent contractor may waive state-mandated training upon acknowledgement of this Policy and documentation that he/she has completed sexual harassment prevention training offered by his/her employer within the last year.

(b) Agencies shall provide sexual harassment prevention training to all new or transferred Covered Employees within thirty (30) calendar days of hire.

(c) Agencies shall require sexual harassment prevention training for supervisors and managers on an annual basis. New supervisors and managers must complete this training within thirty (30) calendar days of employment or promotion to a supervisory or managerial position.

(d) Agencies shall utilize the standardized training provided by HRA to fulfill the obligations under this Policy for employee and manager training.

(e) Agencies shall track and maintain records pursuant to the statewide record retention schedule documenting attendance of employee and manager training. Such records are subject to audit by the OIG.

(f) Agencies shall require designated investigators (see Section IX. Investigations) to complete statewide investigator training provided by the OIG to ensure consistency in sexual harassment investigations across the State. Agencies shall require designated investigators to complete the statewide training within thirty (30) calendar days of the effective date of this Policy. Designated investigators appointed subsequent to the effective date of this Policy shall complete such training as soon as practicable.

VIII. Complaint Procedure

(a) Covered Employees who believe they have been subjected to sexual harassment or retaliation in violation of this Policy are strongly encouraged to promptly submit a complaint regarding the incident(s) to one of the following officials:

1. The Covered Employee's supervisor or manager;
2. The Covered Employee's division director;
3. The Agency's Human Resources Director; or,
4. Other Agency designee.

(b) Covered Employees who have witnessed or otherwise have reason to believe that another employee is being or has been subjected to sexual harassment or retaliation shall promptly report the same to one of the Agency officials listed above.

(c) To the extent that any of the above officials are the alleged harasser or retaliator, or if a Covered Employee has a reasonable fear of retaliation by one of the above officials, a Covered Employee may submit a complaint or report of sexual harassment or retaliation directly to the OIG.

(d) While written complaints and reports of sexual harassment or retaliation are preferred, Agencies shall accept all complaints and reports, whether written, verbal, or anonymous, and will ensure that each complaint or report is promptly and appropriately investigated and resolved.

(e) Agencies shall review all complaints and reports of sexual harassment and retaliation they receive and shall notify the OIG of the same within two (2) business days of receipt.

IX. Investigations

(a) Each Agency shall designate at least two of its employees, not of the same gender, to conduct investigations under this Policy. Agencies must ensure that employees directly supervised by designated investigators have the ability to submit complaints or reports of sexual harassment to an individual other than their direct supervisor or manager.

(b) Agencies shall report to the OIG the names and contact information for the designated investigators and a HR contact via the OIG's online portal within seven (7) business days of the effective date of this Policy. Should a vacancy in an investigator or HR contact role occur, a replacement shall be designated and reported to the OIG within seven (7) business days of the vacancy via the OIG online portal.

(c) Agencies shall cooperate with any determination by the OIG that a complaint or report cannot be handled internally at the Agency from which it originated. Agencies shall cooperate fully with the impartial investigator assigned by the OIG to handle the complaint or report.

(d) The assigned investigator shall complete the investigation and issue a report of findings as promptly as possible but at least within forty-five (45) calendar days of assignment. An Agency Head may consider an extension of time due to extenuating circumstances.

X. Resolution

(a) Agencies shall make a final determination, and if necessary, implement appropriate corrective or disciplinary action and remedial measures depending upon the nature of the policy violation, as soon as possible but in no event more than twenty-one (21) calendar days of receipt of the investigative report.

(b) Agencies shall consult with and provide updates to the OIG as requested and promptly produce any information related to a sexual harassment or retaliation complaint or report or the investigation upon the OIG's request.

(c) Agencies shall, to the extent consistent with thorough investigation and with procedures outlined in this Policy, maintain confidentiality of information reported to the Agency. Complaints and reports of sexual harassment or retaliation, investigative reports, final determinations, and other related documents will be subject to disclosure under the Open Records Act upon completion of the investigation.

XI. Acknowledgement and Recordkeeping

(a) Agencies shall make this Policy available to all Covered Employees and retain documentation of each Covered Employee's acknowledgment of receipt of the Policy in his or her personnel file.

(b) All complaints and reports, investigative documents, policy acknowledgements, and records of training attendance shall be retained pursuant to the statewide record retention schedule and as otherwise required by law pursuant to specific requests for preservation.

Effective Date

This Policy becomes effective March 1, 2019 and may be revised as necessary.

Revision History

Version	Date
1.0	March 1, 2019

Acknowledgement of the State of Georgia Statewide Sexual Harassment Prevention Policy

I acknowledge that I have received, reviewed, and agree to comply with the State of Georgia Statewide Sexual Harassment Prevention Policy. I understand that failure to comply with the Policy could result in corrective action up to and including termination of my contract, removal from Agency premises, restricted access to Agency premises and/or personnel, or notification to my employer.

_____	_____
Contractor Name (please print)	Contractor Signature
_____	
Date	

SECTION E
FEDERAL REQUIREMENTS

E-01 EQUAL EMPLOYMENT OPPORTUNITY

A. All contacts shall contain a provision requiring compliance with E.O. 11246, A Equal Employment Opportunity as amended by E.O. 11375, Amending Executive Order 11246 Relating to Equal Employment Opportunity, and as supplemented by regulations 41 CFR part 60, A Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.

E-02 COPELAND ANTI-KICKBACK ACT (18 U.S.C. 874 AND 40 U.S.C. 276c):

A. All contacts and subgrants in excess of $2,000 for construction or repair awarded by recipients and subrecipients shall include a provision for compliance with he Copeland Anti-Kickback Act (18 U.S.C. 874), as supplemented by Department of Labor regulations (29 CFR part 3, Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loads or Grants from the Untied States). The Act provides that each contractor or subrecipient shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he is otherwise entitled. The recipient shall report all suspected or reported violations to the Federal awarding agency.

E-03 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT (40 U.S.C. 327-33):

A. Where applicable, all contracts awarded by recipients in excess of $2,000 for construction contracts and in excess of $2,500 for other contracts that involve the employment of mechanics or laborers shall include a provision for compliance with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-333), as supplemented by Department of Labor regulations (29 CFR part 5). Under Section 102 of the Act, each contractor shall be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than .5 times the basic rate of pay for all hours worked in excess of 40 hours in the work week. Section 107 of the Act is applicable to construction work and provides that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

E-04 COMPLIANCE WITH AIR AND WATER ACTS:

A. Clean Air Act (42 U.S.C. 7401 et seq.) And the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.) As amended: Contracts and subgrants of amounts in excess of $100,000 shall contain a provision that requires the recipient to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401 et seq.) And the Federal Water Pollution Control Act as amended (33 U.S.C. 1251 et seq.). Violations shall be reported to the Federal awarding agency and the Regional Office of the Environment Protection Agency (EPA).

E-05 BYRD ANTI-LOBBYING AMENDMENT (31 U.S.C. 1352):

A. Contractors who apply or bid for an award of $100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for including or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1351. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosure is forwarded from tier to tier up to the recipient.

E-06 DEBARMENT AND SUSPENSION (E.O.s 12549 and 12689):

A. No contract shall be made to parties listed on the General Services Administrations List of Parties Excluded from Federal Procurement or Non procurement Programs in accordance with E.O.s 12549 and 12689, Debarment and Suspension. This list contains the names of parties debarred, suspended, or otherwise excluded by agencies, and contractors with awards that exceeds the small purchase threshold shall provide the required certification regarding its exclusion status and that of its principal employees.

E-07 SUBCONTRACTING WITH SMALL AND MINORITY FIRMS, WOMEN'S BUSINESS ENTERPRISE, AND LABOR SURPLUS AREA FIRMS:

The Contractor shall take the following steps to ensure that, whenever possible, subcontractors are awarded to small business firms, minority firms, women's business enterprises, and labor surplus area firms:

A. Placing qualified small and minority businesses and women's business enterprises are solicited lists.

B. Ensuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources.

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

D. Establishing delivery schedules, where the requirements of the contract permit, which encourage participation by small and minority businesses and women's business enterprises.

E. Using the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies.

E-08 EQUAL EMPLOYMENT OPPORTUNITY:

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

A. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, or handicap.

B. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, national origin, or handicap. Such action shall include, but not limited to, (1) employment, (2) upgrading, (3) demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) Layoff or termination, (7) rate of pay or other forms of compensation, (8) selection for training, including apprenticeship.

C. The Contractor shall post in conspicuous place available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

D. The contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration by employment without regard to race, color, religion, sex, national origin, or handicap.

E. The contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice is conspicuous places available to employees and applicants for employment.

F. The Contractor shall comply with Executive Order 11246, as amended, and the rules regulations and orders of the Secretary of Labor.

G. The Contractor shall furnish all information and reports required by Executive Order 11246, as amended, Section 503 of the Rehabilitation Act of 1973, as amended, and by rules, regulations,

and orders of the Secretary of Labor, or pursuant thereto: The Contractor shall permit access to its compliance with such rules, regulations, and orders.

H. In the event of a determination that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part, and the contractor may be declared ineligible for further Government contracts, or Federally assisted construction contracts under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.

I. The Contractor shall include the terms and conditions of this clause in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor. The Contractor shall take such action with respect to any subcontract or purchase order as the Secretary of Housing and Urban Development or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided that if the Contractor becomes involved in, or is threatened with, litigation with subcontractor or vendor as a result of such direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

J. Compliance with the requirements of this clause shall be to the maximum extent consistent with, put not in derogation of, compliance with section 7(b) of the Indian Self-Determination and Education Assistance Act.

E-09 INTEREST OF MEMBERS OF CONGRESS:

A. No member of or delegate to the Congress of the United States of America shall be admitted to any share or part of this contract or to any benefit that may arise there from.

E-10 INTEREST OF MEMBERS, OFFICERS, OR EMPLOYEES AND FORMER MEMBERS, OFFICERS, OR EMPLOYEES:

A. No member, officer, or employee of the VA, no member of the governing body of the locality in which the project is situated, no member of the governing body of the locality in which the contract was activated, and no other public official of such locality or localities who exercises any functions or responsibilities which respect to the project, shall, during his or her tenure, or for one year thereafter, have any interests, direct or indirect, in this contract of the proceeds thereof.

E-11 LIMITATIONS ON PAYMENTS MADE TO INFLUENCE CERTAIN FEDERAL FINANCIAL TRANSACTIONS:

A. The Contractor agrees to comply with Section 1352 of title 31, United States Code which prohibits the use of Federal appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the madding of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.

B. The Contractor further agrees to comply with the requirements of the Act to furnish a disclosure (OMB Standard Form LLL, Disclosure of Lobbying Activities) if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer of employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

C. Indian tribes (except those chartered by State) and Indian organizations as defined in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) are exempt from the requirements of this clause.

E-12 EXAMINATION AND RETENTION OF CONTRACTOR'S RECORDS:

A. The VA/DVS, or Comptroller General of the United States, or any of their duly authorized representatives shall, until 3 years after final payment under this contract, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audit, examination, excerpts, and transcriptions.

B. The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as paragraph (a) above. "Subcontract," as used in this clause, excludes purchase orders not exceeding $10,000.00.

C. The periods of access and examination in paragraphs (a) and (b) above for records relating to (1) appeals under the Disputes clause of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the VA/DVS, or Comptroller General or any of their duly authorized representatives has taken exception shall continue until disposition of such appeals, litigation, claims, or exceptions.

E-13 LABOR STANDARDS – DAVIS BACON AND RELATED ACTS:

If the total amount of this contract exceeds $2,000, the Federal labor standards set forth in the clause below shall apply to the construction work to be performed under the contract, except if the construction work has been determined to "Nonroutine Maintenance" subject to the terms of that clause of this contract.

A. **Minimum Wages.**

1. All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates non less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the regular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid not less than the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, that he employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posed at all times by the Contractor and it's subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

2. (i) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefore only when all the following criteria have been met:
   a. The work to be performed by the classification requested is not performed by a classification in the wage determination;
   b. The classification is utilized in the area by the construction industry; and
   c. The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

2. (ii) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representative, and VA/DVS or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a

report of the action taken shall be sent by VA/DVS of its designee to the Administrator of the Wage and Hour Division, Employee Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise VA/DVS or its designee or will notify VA/DVS or its designee within 30-day period that additional time is necessary.

2. (iii) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and VA/DVS or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), or VA/DVS its designee shall refer the questions, including the views of all interested parties and the recommendations of VA/DVS or its designee, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise VA/DVS or its designee or will notify VA/DVS or its designee within the do day period that additional time is necessary.

2.(iv) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (b)(2)(ii) or (iii) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

3. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

4. If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wage of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligation under the plan or program.

B. **Withholding of Funds.** VA/DVS or its designee shall, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal Contract with the same prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or, under the United States Housing Act of 1937 or under the Housing Act of 1949, in the construction or development of the project), all or part of the wages required by the contract, or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. VA/DVS of its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

C. **Payrolls and Basic Records**.

1. Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made,

and actual wages paid. Whenever the Secretary of Labor has found, under 29 CFR 5.5(a)(1)(iv), that the wages of any laborer or mechanic include the amount of costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits in enforceable, that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

2. (i) The Contract shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer for transmission to VA/DVS or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under subparagraph ©(1) of this clause. This information may be submitted in any form desired. Optional form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402. The prime Contractor is responsible for the submission of copies of payrolls by all subcontractors.

2. (ii) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

a. That the payroll for the payroll period contains the information required to be Maintained under paragraph (c) (1) of this clause and that such information is correct and complete;

b. That each laborer or mechanic (including each helper, apprentice, and trainee) Employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 1; and

c. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

2. (iii) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirements for submission of the "Statement of Compliance" required by subparagraph (c) (2)(ii) of t his clause.

2. (iv) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

3. The Contractor of subcontractor shall make the records required under subparagraph (d)(1) available for inspection, copying, or transcription by authorized representatives of VA/DVS or its designee, the Contracting Officer, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, VA/DVS or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

D. 1. **Apprentices.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, employment and Training Administration, Bureau of Apprenticeship and Training or with a State Apprenticeship

Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratio and wage rates (expressed in percentages of the journeymen's hourly rate) specified in the Contractor's or subcontractors registered program shall be observed. Every apprentice must be paid not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

2. **Trainees.** Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen of the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event of the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

3. **Equal Employment Opportunity.** The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal opportunity requirements of Executive Order 11246, as amended, and 29 CFT Part 30.

E. **Compliance With Copeland Act Requirements.** The Contractor shall comply with the requirement of 29 CFR Part 3, which are hereby incorporated by reference in this contract.

F. **Contract Termination; Debarment.** A breach of this contract clause may be grounds for termination of the contract and for debarment as a Contractor and a subcontractor as provided in 29 CFR 5.12.

G. **Compliance With Davis-Bacon and Related Act Requirements.** All rulings and interpretations of the Davis-Bacon and related Acts contained in 29 CFR Parts 1, 2, and 5 are herein incorporated by reference in this contract.

H. **Disputes Concerning Labor Standards.** Disputes arising out of the labor standards provisions of this clause shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6 and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the VA/DVS, the U.S. Department of Labor, or the employees or their representatives.

I. **Certification of Eligibility.**

1. By entering into this contract the Contractor certifies that neither it (nor he or she) nor any person for firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
2. No part of this contract shall be subcontracted to any person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1)
3. The penalty for making false statements is prescribed in the U.S. Criminal Code, 19 U.S.C. 1001.

J. **Contract Work Hours and Safety Standards Act.** As used in this paragraph, the terms "laborers" and mechanics" include watchmen and guards.

1. **Overtime Requirements:** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics, including watchmen and guards, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.
2. **Violation; Liability For Unpaid Wages; Liquidated Damages:** In the event of any violation of the provisions set forth in subparagraph (j)(1) of this clause, the Contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic (including watchmen and guards) employed in violation of the provisions set forth in subparagraph (j)(1) of this clause, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in subparagraph (j)(1) of this clause.
3. **Withholding For Unpaid Wages and Liquidated Damages:** VA/DVS or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any Federal contract with the same prime Contractor, or any other Federally assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in subparagraph (j)(2) of this clause.

K. **Subcontracts:** The Contractor or subcontractor shall insert in any subcontracts all the provisions contained in this clause, and such other clauses as HUD or its designee may be appropriate instructions require, and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The prim Contractor shall be responsible for the compliance any subcontractor or lower tier subcontractor with all these provisions.

E-14 Non-Federal Prevailing Wage Rates:

Any prevailing wage rate (including basic hourly rate and any fringe benefits), determined under State or tribal law to be prevailing, with respect to any employee in any trade or position employed under the

contract, is inapplicable to the contract and shall no be enforced against the Contractor or any subcontractor, with respect to employees engaged under the contract whenever either of the following occurs:

A. Such non-Federal prevailing wage rates exceeds: (A) the applicable wage rate determination by the Secretary of Labor pursuant to the Davis-Bacon Act (40 U.S.C. 27a et seq) to be prevailing in the locality with respect to such tract; (B) an applicable apprentice wage rate based thereon specified in apprenticeship program registered with the U.S. Department of Labor or a DOL-recognized State Apprenticeship Agency; or (C) an applicable trainee wage rate based thereon specified in a DOL-certified trainee program; or

B. Such non-Federal prevailing wage rate, exclusive of any fringe benefits, exceeds the applicable wage rate determination by the Secretary of DOL to be prevailing in the locality with respect to such trade position.

E-15 Build America, Buy America Act (BABAA):

Compliance by Cemeteries with the Build America, Buy America Act (BABAA) requirements in Public Law, 117-58 that the United States produce or manufacturer all iron, steel, manufactured products, and construction materials used in VA-funded projects in the U.S. is mandatory. Cemeteries must certify that they will use grant funds for projects that meet BABAA domestic content procurement preferences.

The United States must produce or manufacture all iron, steel, and construction materials used in VA-funded projects in the U.S. The United States must manufacture all products used in VA-funded project in the U.S. (cost of components of the U.S. manufactured product must be greater than 65% of the total cost of all components).

A. Infrastructure Investment and Jobs Act – Agreement: In accordance with the Pub. L. No. 117-58, which includes the Build America, Buy America Act ("the Act"). Pub. L. No. I 17-58, §§ 70901-52. The Act strengthens Made in America Laws and will bolster America's industrial base, protect national security, and support high-paying jobs. The Act requires that the head of each Federal agency shall ensure that "none of the funds made available for a Federal financial assistance program for infrastructure may be obligated for a project unless all of the iron, steel, manufactured products, and construction materials used in the project are produced in the United States."

1. The CONTRACTOR agrees that only domestic construction material will be used (by the CONTRACTOR, subcontractors, materialmen, and suppliers) in the performance of this CONTRACT, except for nondomestic construction material listed in the "Nondomestic Construction Materials" Clause, if any, of this CONTRACT.
2. DOMESTIC CONSTRUCTION MATERIAL: "Construction material" means any article, material, or supply brought to the construction site for incorporation in the building or work. An unmanufactured construction material is a "domestic construction material" if it has been mined or produced in the United States. A manufactured construction materia1 (excluding cement and cementitious materials, aggregates such as stone, sand, or gravel, or aggregate binding agents or additives is a "domestic construction material" if it has been manufactured in the United States and if the cost of its components which have been mined, produced, or manufactured in the United States exceeds 65% of the cost of all its components. "Component" means any article, material, or supply directly incorporated in a construction material.
3. DOMESTIC COMPONENT: A component shall be considered to have been "mined, produced, or manufactured in the United States" (regardless of its source in fact) if the article, material, or supply in which it is incorporated was manufactured in the United States and the component is of a class or kind determined by the Government to be not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality.

OMB NUMBER: 2900-0559
Expiration Date: Oct. 31, 2026
Respondent Burden: 15 minutes

VA | U.S. Department of Veterans Affairs

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION - LOWER TIER COVERED TRANSACTIONS *(Contractor)*

Respondent Burden: Public reporting burden for this collection of information is estimated to average 15 minutes. Statutory authority for a State Cemetery Grant is 38 U.S.C. 2408. The information requested is necessary to ensure that the contractor has not been debarred, suspended or is ineligible to participate in the VA grant process and receive Federal funds. VA may not conduct or sponsor and you are not required to respond to this collection of information unless it displays a valid OMB number. Respond to this collection is voluntary. Send comments regarding this burden estimate or any other aspects of this collection of information, including suggestions for reducing this burden, to OIRA Desk Officer for VA, 725 17th St NW, Washington, DC 20503. SEND COMMENTS ONLY. Please do not send applications for a grant to this address.

AUTHORITY: This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, Title 2 Part 180, Participants' Responsibilities. The regulations were published as Part VII of the May 26, 1988, Federal Register (pages 19160 - 19211). Copies of the regulations may be obtained by contacting the person to whom this proposal is submitted.

CERTIFICATION: The authorized representative certifies, by submission of this form, that neither the representative nor principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

INSTRUCTIONS:

1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

2. The certification in this clause is a material representation of act upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

3. The prospective lower tier participant shall provide immediate written notice to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms "covered transaction," "participant," "person," "primary covered transaction," "principle," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to whom this proposal is submitted for assistance in obtaining a copy of those regulations.

5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

6. The prospective lower tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion-Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

NAME AND ADDRESS OF COMPANY:	PROJECT FAI *(Federal Application Identifier)* NO.
NAME OF LOWER TIER PARTICIPANT	TITLE OF LOWER TIER PARTICIPANT
SIGNATURE OF LOWER TIER PARTICIPANT	DATE SIGNED *(mm/dd/yyyy)*

EMPLOYEE RIGHTS
UNDER THE DAVIS-BACON ACT

FOR LABORERS AND MECHANICS EMPLOYED ON FEDERAL OR FEDERALLY ASSISTED CONSTRUCTION PROJECTS

THE UNITED STATES DEPARTMENT OF LABOR WAGE AND HOUR DIVISION

PREVAILING WAGES	You must be paid not less than the wage rate listed in the Davis-Bacon Wage Decision posted with this Notice for the work you perform.
OVERTIME	You must be paid not less than one and one-half times your basic rate of pay for all hours worked over 40 in a work week. There are few exceptions.
ENFORCEMENT	Contract payments can be withheld to ensure workers receive wages and overtime pay due, and liquidated damages may apply if overtime pay requirements are not met. Davis-Bacon contract clauses allow contract termination and debarment of contractors from future federal contracts for up to three years. A contractor who falsifies certified payroll records or induces wage kickbacks may be subject to civil or criminal prosecution, fines and/or imprisonment.
APPRENTICES	Apprentice rates apply only to apprentices properly registered under approved Federal or State apprenticeship programs.
PROPER PAY	If you do not receive proper pay, or require further information on the applicable wages, contact the Contracting Officer listed below:

Russell Feagin

Executive Director, Health Contracting & Facilities

Department of Veterans Service Wheeler Bldg.,

Rm. D-135

2249 Vinson Hwy.

Milledgeville, Georgia 31061

(478) 445-2544

or contact the U.S. Department of Labor's Wage and Hour Division.

For additional information:

1-866-4-USWAGE

(1-866-487-9243) TTY: 1-877-889-5627

WHD U.S. Wage and Hour Division

WWW.WAGEHOUR.DOL.GOV

"General Decision Number: GA20260311 05/18/2026

State: Georgia

Construction Types: Building

Counties: Georgia Counties of
Richmond

Modification Number	Publication Date
1	01/23/2026
2	05/18/2026

ASBE0048-003 04/01/2025

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR	$ 33.90	18.80

ELEC1579-004 10/01/2025

	Rates	Fringes
ELECTRICIAN	$ 32.25	16.95

ENGI0474-005 07/01/2024

	Rates	Fringes
POWER EQUIPMENT OPERATOR: (BACKHOE/ EXCAVATOR/ TRACKHOE)	$ 33.00	17.70

ENGI0926-005 08/01/2025

	Rates	Fringes
OPERATOR: CRANE	$ 38.53	16.08

ENGI0926-006 08/01/2025

	Rates	Fringes
OPERATOR: FORKLIFT	$ 32.93	16.08

IRON0387-002 01/01/2025

	Rates	Fringes
IRONWORKER: ORNAMENTAL	$ 32.00	15.05
IRONWORKER, STRUCTURAL	$ 32.00	15.05

IRON0387-002 01/28/2025

	Rates	Fringes
IRONWORKER: ORNAMENTAL	$ 32.00	15.05
IRONWORKER, STRUCTURAL	$ 32.00	15.05

PLUM0072-006 08/01/2025

	Rates	Fringes
PIPEFITTER	$ 41.18	17.01

SHEE0085-023 07/01/2025

	Rates	Fringes
SHEET METAL WORKER	$ 38.29	17.40

SUGA2017-026 04/15/2021

	Rates	Fringes
PLUMBER	$ 28.28	2.41
PAINTER: SPRAY	$ 16.29	0.00
PAINTER (BRUSH AND ROLLER)	$ 16.14	0.00
OPERATOR: ROLLER	$ 14.05	0.00
OPERATOR: LOADER	$ 14.86	0.00
OPERATOR: GRADER/BLADE	$ 16.80	0.00
OPERATOR: BULLDOZER	$ 15.23	0.00
OPERATOR: BOBCAT/SKID STEER/SKID LOADER	$ 14.88	0.00
LABORER: PIPELAYER	$ 12.55	1.90
LABORER: COMMON OR GENERAL	$ 13.29	0.00
CEMENT MASON/CONCRETE FINISHER	$ 22.92	0.00
CARPENTER	$ 24.83	0.00

UAVGGA0001 01/01/2025

	Rates	Fringes
IRONWORKER: REINFORCING	$ 31.31	17.68

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Note: Executive Order 13658 generally applies to contracts subject to the Davis-Bacon Act that were awarded on or between January 1, 2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does not apply to contracts subject only to the Davis-Bacon Related Acts regardless of when they were awarded. If a contract is subject to Executive Order 13658, the contractor must pay all covered workers at least $13.65 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract from May 11, 2026, through December 31, 2026. The applicable Executive Order minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under Executive Order 13658 is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than **SU**, **UAVG**, **SA**, or **SC** denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The **SU** identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date,

6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

"SU" wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The "SA" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the "SA" identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

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2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

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Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION

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"General Decision Number: GA20260067 05/18/2026

State: Georgia

Construction Types: Highway

Counties: Georgia Counties of
Burke, Columbia, Lincoln, McDuffie and
Richmond

Modification Number	Publication Date
0	01/02/2026
1	05/18/2026

SUGA2022-007 07/12/2024

	Rates	Fringes
TRUCK DRIVER: DUMP TRUCK	$ 21.58	3.58
TRAFFIC CONTROL: FLAGGER	$ 14.64	0.00
OPERATOR: ROLLER	$ 18.51	3.99
OPERATOR: PAVER (ASPHALT, AGGREGATE, AND CONCRETE)	$ 23.22	4.10
OPERATOR: LOADER	$ 22.81	1.91
OPERATOR: GRADER/BLADE	$ 26.31	5.43
OPERATOR: CRANE	$ 39.31	0.00
OPERATOR: BULLDOZER	$ 22.82	0.00
OPERATOR: BACKHOE/EXCAVATOR/TRACKHOE	$ 23.40	3.73
LABORER: PIPELAYER	$ 22.42	0.00
LABORER: COMMON OR GENERAL	$ 15.50	0.00
LABORER: ASPHALT, INCLUDES RAKER, SHOVELER, SPREADER AND DISTRIBUTOR	$ 16.72	2.23
CEMENT MASON/CONCRETE FINISHER	$ 28.44	0.00
CARPENTER	$ 32.68	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

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Wage and Hour Division
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U.S. Department of Labor
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Washington, DC 20210

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Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION

"

csra TESTING & ENGINEERING CO., INC.
1005 Emmett Street, Suite A, Augusta, Georgia 30904 • (706) 733-6960 • Fax (706) 737-0629

April 14, 2026

2KM Architects, Inc.
529 Greene Street
Augusta, Georgia 30901

Attn: Ms. Megan Poston

Re: Report of Geotechnical Exploration
Georgia Veterans Memorial Cemetery
3708 Byrd Road
Augusta, Georgia
CSRA Report No. B-015.26

Dear Ms. Poston:

CSRA Testing & Engineering Company, Inc., (CSRA) is pleased to submit this report of our exploration services for the proposed project. Our services were provided in accordance with your signed authorization of our proposal. This report presents a review of the information provided to us, a discussion of the site and subsurface conditions, and our foundation and earthwork recommendations. The Appendix contains a Boring Location Plan and the results of our field testing.

Project Information

Based on the information provided, the project involves the construction of the Georgia Veterans Memorial Cemetery (GVMC) on a portion of the East Central Regional Hospital campus in Augusta, Georgia. It is our understanding that Phase 1 of the GVMC will include a conventional burial area, an in-ground cremains area, a pre-placed crypts area, a ceremonial area, a columbarium, a committal shelter, and single-story administrative and maintenance buildings. The foundation systems for some of these areas will consist of lightly loaded shallow footings with a concrete slab on grade for the buildings. Based on our review of the preliminary grading plan, most of these areas are currently within 1 to 1.5 feet of planned final grades. However, the columbarium, committal shelter, and maintenance building will require fills of up to approximately 6.0 to achieve finished grades. We anticipate the fills for the maintenance building will be within foundation walls constructed near existing grades.

Purpose Of Exploration

The purpose of this exploration was to obtain specific subsurface data at the site and to provide foundation and earthwork recommendations for the proposed project.

Site Conditions

We conducted a site reconnaissance to observe and document surface conditions at the site. The information gathered was used to help us interpret the subsurface data and to detect conditions which could affect our recommendations.

The GVMC site is located within the East Central Regional Hospital (former Gracewood State School and Hospital) campus in Augusta, Georgia. The Phase 1 project area is open and grassed with scattered trees and some small, wooded areas. The ground surface is gently sloping to the south and west. No surface water was noted near the boring locations at the time of our field work.

Site Geologic Conditions

The project site is located in the Sand Hills section of the Coastal Plain Physiographic Province. The Coastal Plain consists mainly of marine sediments which were deposited during successive periods of fluctuating sea level and moving shoreline. The formations dip slightly seaward, and several are exposed at the surface in bands paralleling the coast. Many beds exist only as fragmental erosional remnants sandwiched between more continuous strata above and below. Based on published literature, the site is underlain by Coastal Plain sediments consisting of interbedded silts, sands, and clays.

Subsurface Conditions

The subsurface conditions were explored with widely spaced soil test borings drilled according to the procedures presented in the Appendix. The boring locations and depths were selected by CSRA. The boring locations were determined in the field by our drill crew using GPS coordinates. Boring elevations were obtained by interpolation between contours on the drawing provided to us. The boring locations shown in the Appendix should be considered accurate only to the degree implied by the method used.

The subsurface conditions encountered at the boring locations are shown on the boring logs in the Appendix. These boring records represent our interpretation of the subsurface conditions based on the field logs and visual examination of field samples by our geotechnical engineer. The lines designating the interface between various strata on the boring records represent the approximate interface location. The water levels shown on the boring logs represent the conditions only at the time of our exploration.

Sixteen (16) test borings were drilled in/near the proposed structures/areas to a depth of 15 feet below the ground surface. The borings revealed a surficial layer of topsoil to depths of 3 to 12 inches. Below the surficial layer, typical Coastal Plain deposits were encountered and consisted of interbedded layers of sandy, clayey silts (ML) and sands with varying fine grained particle content. The sandy soils ranged from silty (SM) to very clayey (SC) and were recorded to be very loose to dense in consistency. Standard penetration resistances were from 2 to 46 blows per foot. The soft to hard sandy, clayey silts (ML) had standard penetration resistances from 3 to 49 blows per foot.

Groundwater Conditions

Groundwater was not encountered in the borings at the time of drilling. In silty sands the water levels can usually be determined accurately near the time of drilling. In fine grained soils and clayey sands, it may take several days for water levels to stabilize. Fluctuations in the groundwater level can occur due to variations in rainfall, evaporation, construction activity, surface runoff, and other site-specific factors. The highest groundwater levels are generally encountered in early spring and the lowest in late summer.

The likelihood of groundwater in the near surface soils at some areas of the site can be expected to increase following periods of wet weather due to rainwater infiltration through the upper sands. The water can then become "perched" on top of the hard clayey silts below.

Site Preparation Recommendations

All topsoil, vegetation, and surface soils containing organic material should be removed from the proposed construction area and wasted from the site or used as topsoil in areas to be landscaped. The depth of topsoil encountered in our borings was approximately 3 to 12 inches. Also, our experience with similar subsurface conditions and similar structural requirements indicates that shallow foundations will not be suitable unless the near surface very loose clayey sands (SC) and soft clayey silt (ML) soils encountered in borings B-7, B-9, B-10, B-11 and B-13 be removed and replaced with properly compacted fill. We anticipate that these soils will require undercutting to a depth of about 3 feet below existing grades. We recommend the undercutting extend for a lateral distance of 5 feet from the edge of the any proposed foundations. The very loose silty sands (SM) encountered in boring B-13 may be left in place and densified from the surface with a heavy vibratory roller prior to fill placement in this area.

Positive surface drainage should be maintained to prevent the accumulation of water, if possible. If the exposed subgrade becomes excessively wet or frozen, or if different conditions are encountered from those described previously in this report, the geotechnical engineer should be contacted.

After stripping and rough grading, we recommend the subgrade be proofrolled prior to excavation of foundations or placing structural fills. The proofrolling operation should be observed and documented by the construction testing agency. If unsuitable conditions are encountered at the subgrade level, recommendations for dealing with the conditions should be provided to the owner's representative by the geotechnical engineer. Any excessively wet soils encountered should either be scarified, dried, and compacted or excavated and replaced with properly compacted fill.

Foundation Recommendations

We recommend a system of shallow spread footings be utilized to support the proposed structures. Based on the anticipated grades, shallow footings will bear in loose virgin sands, firm to hard ML soils and compacted fill. Shallow footings bearing in these materials can be designed for a maximum allowable net bearing pressure of 2,000 psf if the Site Preparation Recommendations and Compacted Fill Recommendations sections of this report are followed throughout.

The maximum net allowable bearing pressure recommended is based on our previous experience and correlations made previously between standard penetration test resistances and the performance of foundations supported by soils similar to those at this site. We expect total settlements on the order of 1 inch and differential settlements of less than 0.5 inch.

We recommend the walls be provided with construction joints at locations of change in soil support from very stiff to hard virgin soils to very loose/firm virgin soils and compacted fill in order to accommodate some possible differential settlements at such locations. Individual column footings (if any) should be entirely supported by either compacted fill or virgin material.

We recommend the minimum widths for individual column and continuous wall footings be 24 and 16 inches, respectively. The minimum widths are recommended to provide a margin of safety against a local or punching shear failure of the foundation soils. Exterior footings should bear at least 18 inches below final exterior grade. The depths of interior footings should be a minimum of 12 inches below the top of the floor slab. This embedment is necessary to provide adequate confinement of the bearing soils and to achieve the recommended bearing pressure.

Foundation concrete should be placed the same day that excavations are dug, if possible. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight or if rainfall becomes imminent while the bearing soils are exposed, we suggest a 2 to 4-inch thick "mud-mat" of "lean" (2,000 psi) concrete be placed on the bearing soils before the placement of reinforcing steel.

We recommend the construction testing agency observe the footing excavations immediately prior to placing concrete. They should compare the soils exposed with those encountered in the test borings and document the results. Any significant differences should be brought to the attention of the owners' representative along with appropriate recommendations. The foundation bearing area should be level or suitably benched. It should also be free of loose soil, ponded water, and debris prior to the inspection.

Grade Slab Recommendations

We understand that soil supported grade slab will be used for some of the proposed structures. The grade slabs should be jointed around columns and along footing supported walls so that the slabs and foundations can settle differentially without damage. Joints containing dowels or keys may be used in the slabs to permit rotational movement between parts of the slabs without cracking or sharp vertical displacements.

A 4 to 6 inch layer of clean gravel or free draining sand covered with an impermeable membrane should be placed beneath the grade slabs to provide a vapor barrier and permit lateral drainage beneath the slab.

Piping underneath the grade slabs should be avoided whenever possible. Where absolutely necessary, pipe joints must be tight to prevent leakage. Leakage from under floor piping is often the source of excessive soil moisture which can lead to damage due to potential soil expansion or erosion.

Construction activities and exposure to the environment can cause deterioration of prepared subgrades. Therefore, we recommend density and moisture content tests be conducted on the final subgrade soils immediately prior to grade slab construction to determine their condition.

Compacted Fill Recommendations

We recommend the soils used as compacted fills be free of debris and have less than 3% by weight fibrous organic material. They should have a maximum dry density of at least 90 pcf, a liquid limit of less than 50, and a plasticity index of less than 20. Before filling operations begin, representative samples of each proposed fill material should be collected. The samples should be tested to determine the maximum dry density, optimum moisture content, natural moisture content, gradation, and plasticity of the soil. These tests are needed for quality control during compaction and also to determine if the fill material is acceptable. The near surface soils encountered at the site are acceptable for use as compacted fill. Any near surface soils which are overly moist at the time of construction will require drying prior to immediate use as compacted fill. In addition, we do not recommend crushed brick and concrete be utilized as structural fill. This is because the size, amount of fine-grained particles and angular properties are not as predictable as for clean gravel.

We recommend all compacted fill be constructed by spreading acceptable soil in loose layers not more than 8 inches thick. The fill should be compacted in thin lifts to at least 95 percent of the Standard Proctor maximum dry density (ASTM D-698). The moisture content of the fill soils should be maintained within +3 and -3 percentage points of the optimum moisture content as determined from the Proctor compaction test. This provision may require the contractor to dry the soils during periods of wet weather or wet the soils during the hot summer months.

The fill surface must be adequately maintained during construction to achieve an acceptable compacted fill. We recommend the fill surface be sloped to achieve sufficient drainage and to prevent water from ponding on the fill. If precipitation is expected while fill construction is temporarily halted, the surface should be rolled with rubber tired or steel drummed equipment to improve surface run-off. If the surface soils become excessively wet or frozen, fill operations should be halted, and the geotechnical engineer should be consulted for guidance.

We recommend the fill placement and compaction be observed and documented by the geotechnical engineer. Significant deviations, either from specifications or good practice, should be brought to the attention of the owner's representative, along with appropriate recommendations. At least one (1) field density test should be performed in each 5,000 square feet of fill for each fill layer.

Pavement Recommendations

No subgrade strength tests have been performed at this time. However, based on our experience with similar conditions, we recommend a design CBR value of 6 be used for preliminary thickness determinations for pavements supported by the near surface ML soils. If pavements or sections of pavements are to be constructed on compacted fill, we recommend the fill material be placed slightly dry of optimum moisture content.

The base and asphalt concrete surface course materials should comply with and should be constructed in accordance with the Georgia Department of Transportation standard specifications.

We recommend the exposed subgrade in the pavement areas be proofrolled to detect unsuitable soil conditions. Proofrolling should be done just prior to paving and after a suitable period of dry weather to avoid degrading an otherwise acceptable subgrade. Proofrolling should be performed with a heavily loaded dump truck or with similar approved construction equipment. The proofrolling equipment should make at least four (4) passes over each section, with the last two (2) passes perpendicular to the first two (2).

Infiltration Estimates

An infiltration test (I-1) was performed in the Phase 1 Ceremonial area as shown on the Boring Location Plan. A double ring infiltrometer test (ASTM D-3385) was performed by seating the outer ring approximately 4 inches into the ground surface. The inner ring and annular ring spaces were filled with water. The drop in water level was measured at time increments of 15 minutes and recorded until a constant rate was achieved. The measurements showed an infiltration rate of 1.0 inch/hour.

Basis For Recommendations

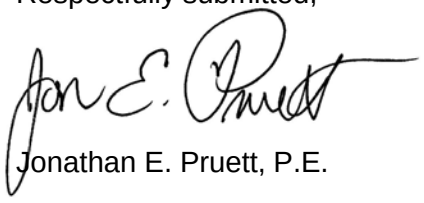
The recommendations provided are based in part on project information provided to us and they only apply to the specific project and site discussed in this report. If the project information section in this report contains incorrect information or if additional information is available, you should convey the correct or additional information to us and retain us to review our recommendations. We can then modify our recommendations if they are inappropriate for the proposed project.

Regardless of the thoroughness of a geotechnical exploration, there is always a possibility conditions between borings will be different from those at specific boring locations and conditions will not be as anticipated by the designers or contractors. In addition, the construction process may itself alter soil conditions. Therefore, experienced geotechnical personnel should observe and document the construction procedures used and the conditions encountered. Unanticipated conditions and inadequate procedures should be reported to the design team along with timely recommendations to solve the problems created. We recommend the owner retain CSRA to provide this service based upon our familiarity with the project, the subsurface conditions, and the intent of the recommendations.

We wish to remind you our exploration services include storing the samples collected and making them available for inspection for 60 days. The samples are then discarded unless you request otherwise.

We will be happy to discuss our recommendations with you and would welcome the opportunity to provide the additional studies or services necessary to complete this project. We appreciate the opportunity to provide our professional services and look forward to working with you on the remainder of this project and on future projects. If you have any questions concerning this report or wish to have further discussions, please contact us at (706) 733-6960.

Respectfully submitted,

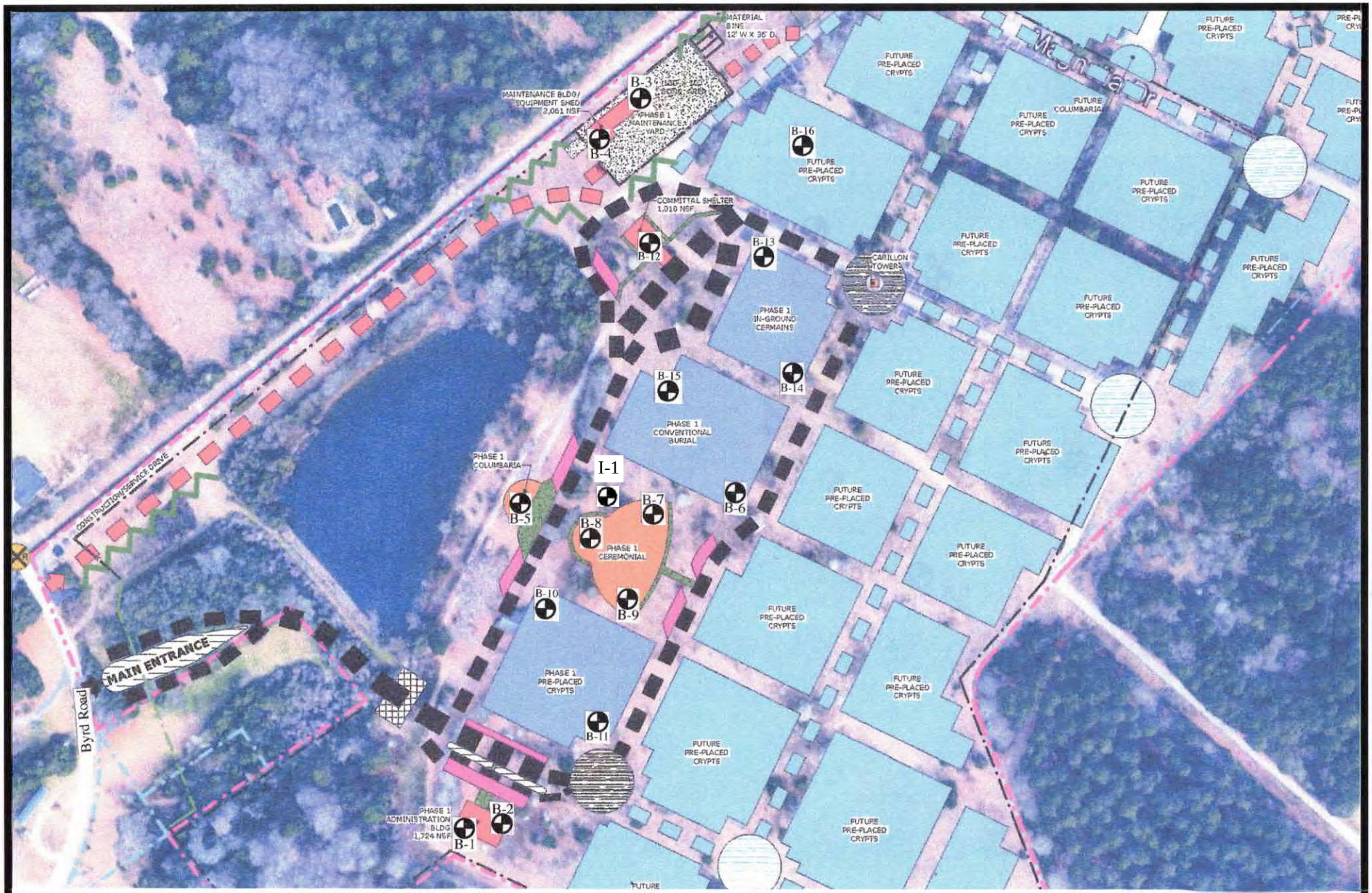


Jonathan E. Pruett, P.E.

APPENDICES

APPENDIX I

Boring Location Plan



Reference : Site Plan Provided By 2KM Architects, Inc.

csra

TESTING & ENGINEERING CO., INC.

1005 Emmett Street, Suite A ■ Augusta, Georgia 30904 ■ (706) 733-6960

BORING LOCATION PLAN

GVMC Augusta
Augusta, Georgia

JOB NO.	DESIGNED BY
B-015.26	
SCALE	DRAWN BY
1"= 200'	R.W.S.
DATE	CHECKED BY
03/24/26	J.M.P.

APPENDIX II

Boring Logs

csra TESTING & ENGINEERING CO., INC.
1005 Emmett Street, Suite A, Augusta, Georgia 30904 • (706) 733-6960 • Fax (706) 737-0629

PROJECT GVMC Augusta BORING NO. B-1

LOCATION 3708 Byrd Road, Augusta, GA DATE February 11, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Very Stiff, Tan and Red Sandy Clayey Silt	24 @ 1'	ML	
5'	Dense, Tan, Red, Gray, and Purple Clayey Silty Sand	31 @ 3.5' 45 @ 6'	SC	
10'	Dense, Reddish-Tan Silty Sand	40 @ 8.5' 45 @ 13.5'	SM	
15'	Boring Terminated at 15 feet. Upper 8" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-2

LOCATION 3708 Byrd Road, Augusta, GA DATE February 11, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Brownish-Tan Silty Sand	38 @ 1'	SM	
		44 @ 3.5'		
5'	Hard, Tan, Red, White, and Purple Sandy Clayey Silt	47 @ 6'	ML	
		37 @ 8.5'		
10'				
	Very Firm, Reddish-Tan Silty Sand	26 @ 13.5'	SM	
15'	Boring Terminated at 15 feet. Upper 4" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-3

LOCATION 3708 Byrd Road, Augusta, GA DATE February 12, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Loose, Reddish-Tan Silty Sand	6 @ 1'	SM	
		8 @ 3.5'		
5'	Loose to Firm, Reddish-Tan Clayey Sand	11 @ 6'	SC	
		22 @ 8.5'		
10'	Very Stiff, Tan and Red Sandy Clayey Silt		ML	
		30 @ 13.5'		
15'	Boring Terminated at 15 feet. Upper 8" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-4

LOCATION 3708 Byrd Road, Augusta, GA DATE February 12, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Firm, Reddish-Tan Sandy Clayey Silt (Moist)	6 @ 1'	ML	
5'	Very Stiff, Red, Tan, and Gray Sandy Clayey Silt	22 @ 3.5' 27 @ 6'	ML	
10'	Firm, White, Tan, and Red Silty Sand	15 @ 8.5' 17 @ 13.5'	SM	
15'	Boring Terminated at 15 feet. Upper 3" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer
required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-5

LOCATION 3708 Byrd Road, Augusta, GA DATE February 12, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Brownish-Tan Silty Sand	8 @ 1'	SM	
	Firm, Tan and Red Sandy Clayey Silt (Moist)	22 @ 3.5'	ML	
5'	Very Firm to Dense, Gray and Red Clayey Silty Sand with Gravel	46 @ 6'	SC	
		26 @ 8.5'		
10'	Very Firm, Tan, Red, and White Silty Sand with Gravel	23 @ 13.5'	SM	
15'	Boring Terminated at 15 feet. Upper 4" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-6

LOCATION 3708 Byrd Road, Augusta, GA DATE February 13, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Brownish-Tan Silty Sand	5 @ 1'	SM	
	Loose, Tan Clayey Sand (Moist)	13 @ 3.5'	SC	
5'		30 @ 6'		
	Stiff to Very Stiff, Tan, Red, and Gray Sandy Clayey Silt (Moist)	27 @ 8.5'	ML	
10'				
		24 @ 13.5'		
15'	Boring Terminated at 15 feet. Upper 6" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-7

LOCATION 3708 Byrd Road, Augusta, GA DATE February 13, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Very Loose, Brown Clayey Silty Sand (Moist)	3 @ 1'	SC	
		23 @ 3.5'		
5'	Very Stiff to Hard, Gray, Red, and Tan Sandy Clayey Silt	44 @ 6'	ML	
		31 @ 8.5'		
10'	Dense, Tan and Red Silty Coarse Sand	40 @ 13.5'	SM	
15'	Boring Terminated at 15 feet. Upper 6" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-8

LOCATION 3708 Byrd Road, Augusta, GA DATE February 11, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Loose, Tan Very Clayey Sand (Moist)	6 @ 1'	SC	
		26 @ 3.5'		
5'	Very Stiff to Hard, Tan, Gray, and Red Sandy Clayey Silt with SM Lenses	41 @ 6'	ML	
		28 @ 8.5'		
10'	Very Firm to Dense, Tan, White, and Red Silty Sand		SM	
		31 @ 13.5'		
15'	Boring Terminated at 15 feet. Upper 8" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-9

LOCATION 3708 Byrd Road, Augusta, GA DATE February 11, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Brownish-Tan Silty Sand	3 @ 1'	SM	
	Soft, Tan Sandy Clayey Silt (Wet)		ML	
		47 @ 3.5'		
5'		24 @ 6'		
	Hard to Very Stiff, Red, Brown, Tan, and Gray Sandy Clayey Silt		ML	
10'		27 @ 8.5'		
		30 @ 13.5'		
15'	Boring Terminated at 15 feet. Upper 3" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-10

LOCATION 3708 Byrd Road, Augusta, GA DATE February 11, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Soft, Tan Sandy Clayey Silt (Wet)	4 @ 1'	ML	
	Very Stiff, Tan and Red Sandy Clayey Silt	28 @ 3.5'	ML	
5'	Dense, Gray and Red Silty Sand	37 @ 6'	SM	
	Hard, White, Tan, and Red Sandy Clayey Silt	38 @ 8.5'	ML	
10'	Dense, Tan and White Silty Sand	32 @ 13.5'	SM	
15'	Boring Terminated at 15 feet. Upper 10" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer
required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-11

LOCATION 3708 Byrd Road, Augusta, GA DATE February 11, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Soft, Tan Sandy Clayey Silt (Wet)	4 @ 1'	ML	
	Hard, Red, Brown, and Tan Sandy Clayey Silt	49 @ 3.5'	ML	
5'	Very Firm, Reddish-Tan Clayey Silty Sand	27 @ 6'	SC	
	Very Firm, Reddish-Tan Silty Sand	21 @ 8.5'	SM	
10'	Hard, White and Red Sandy Clayey Silt	31 @ 13.5'	ML	
15'	Boring Terminated at 15 feet. Upper 5" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer
required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-12

LOCATION 3708 Byrd Road, Augusta, GA DATE February 12, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Very Loose, Brownish-Tan Silty Sand	3 @ 1' 2 @ 3.5'	SM	
5'	Firm, Tan Sandy Clayey Silt (Moist)	7 @ 6'	ML	
	Very Stiff, Tan, Red, Gray Sandy Clayey Silt	23 @ 8.5'	ML	
10'	Firm, White, Tan, and Red Silty Sand	14 @ 13.5'	SM	
15'	Boring Terminated at 15 feet. Upper 12" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-13

LOCATION 3708 Byrd Road, Augusta, GA DATE February 12, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Very Loose, Tan Clayey Sand (Moist)	3 @ 1'	SC	
	Firm, Tan Sandy Clayey Silt (Moist)	6 @ 3.5'	ML	
5'	Very Stiff, Tan, Red, and Gray Sandy Clayey Silt	17 @ 6'	ML	
10'		27 @ 8.5'		
	Firm, White and Tan Silty Sand	13 @ 13.5'	SM	
15'	Boring Terminated at 15 feet. Upper 10" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer
required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-14

LOCATION 3708 Byrd Road, Augusta, GA DATE February 12, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Brownish-Tan Silty Sand	5 @ 1'	SM	
	Loose to Firm, Tan Clayey Sand	18 @ 3.5'	SC	
5'		29 @ 6'		
	Very Stiff, Gray, Tan, and Red Sandy Clayey Silt	23 @ 8.5'	ML	
10'				
	Dense, Red, Tan, and White Silty Sand	31 @ 13.5'	SM	
15'	Boring Terminated at 15 feet. Upper 6" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer
required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-15

LOCATION 3708 Byrd Road, Augusta, GA DATE February 13, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Loose, Tan Clayey Sand (Moist)	6 @ 1'	SC	
	Firm, Tan, Red, and Gray Sandy Clayey Silt	11 @ 3.5'	ML	
5'	Very Firm, Gray and Red Clayey Sand	26 @ 6'	SC	
		38 @ 8.5'		
10'	Dense, Gray, Red, and Tan Silty Sand		SM	
		33 @ 13.5'		
15'	Boring Terminated at 15 feet. Upper 12" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

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PROJECT GVMC Augusta BORING NO. B-16

LOCATION 3708 Byrd Road, Augusta, GA DATE February 12, 2026

DEPTH FEET	VISUAL SOIL DESCRIPTION	PENETRATION VALUE (N)	VISUAL UNIFIED CLASS.	PERCENT MOISTURE
	Reddish-Brown Clayey Silty Sand (Fill)	5 @ 1'	SC	
	Loose, Tan Clayey Sand (Moist)	10 @ 3.5'	SC	
5'		29 @ 6'		
	Very Stiff to Hard, Gray and Red Sandy Clayey Silt	31 @ 8.5'	ML	
10'				
	Firm, White and Tan Silty Sand	16 @ 13.5'	SM	
15'	Boring Terminated at 15 feet. Upper 3" is Topsoil.			
20'				
25'				
30'				
35'				
40'				

N Value is number of blows of 140 pound hammer required to drive 2" split-tube sampler one foot after seated.

NO WATER TABLE AT TIME OF BORING

APPENDIX III

Field Testing Procedures

FIELD TESTING PROCEDURES

SOIL TEST BORINGS

Soil sampling and penetration testing were performed in general accordance with ASTM D 1586.

The borings were made by mechanically twisting a continuous steel flight hollow stem auger into the soil. At regular intervals, soil samples obtained with a standard 1.4 inch I.D., 2 inch O.D., split-barrel sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded as the "penetration resistance". The penetration resistance, when properly evaluated, is an index to the soil strength and foundation supporting capability.

Representative portions of the soil samples, obtained from the sampler, were placed in glass jars and transported to our laboratory. In the laboratory, the samples were examined by an engineer to verify the driller's field classifications. Test boring records are attached, graphically showing the soil descriptions and penetration resistances.

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March 17, 2026

Client: 2KM Architects, Inc.
529 Greene Street
Augusta, GA 30901
Attn: Ms. Megan Poston, mposton@2kmarchitects.com

Project: Pre-Demolition Asbestos Inspection
Veterans Cemetery Project
Building #99 and Associated Pumphouse
East Central Regional Hospital – Gracewood
100 Myrtle Boulevard
Gracewood, GA
Report Number: 619-216-005

On February 26-27, 2026 and on March 11, 2026, representatives of Alternative Construction & Environmental Solutions, Inc., performed a pre-demolition asbestos inspection of the above referenced structure for the presence of asbestos-containing materials (ACM). Individuals who hold accreditation as AHERA Inspectors conducted the inspection.

Attached is a report of findings from the inspection. If you have any questions or need additional information, please feel free to give us a call.

ALTERNATIVE CONSTRUCTION & ENVIRONMENTAL SOLUTIONS, INC.

Cliff Hampton
Manager
Industrial Hygiene, Safety & Health Dept.

Steve Connor
Project Manager

Attachments

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1.0 EXECUTIVE SUMMARY

Representatives of Alternative Construction & Environmental Solutions, Inc., performed an asbestos inspection of a structure located on the Gracewood Campus of East Central Regional Hospital in Gracewood, Georgia on February 26-27, 2026 and on March 11, 2026. The purpose of the inspection was to determine if asbestos-containing materials would be encountered during demolition of the structure. Random samples of suspect materials were collected and analyzed for asbestos content.

It is ACES' understanding that the structure is scheduled for demolition. The asbestos inspection, therefore, was performed to comply with 29 CFR 1926.1101. During demolition, the identified friable ACM or non-friable ACM that might become friable during demolition must be abated prior to disturbance. A State of Georgia licensed asbestos contractor using a licensed supervisor/foreman and properly trained workers in accordance with a project design prepared by an accredited project designer must perform asbestos abatement. In addition, an air monitoring professional should perform third-party air monitoring during abatement. It is important to note that Federal and State regulations require a 10-day notification prior to any renovation/demolition activities that may impact the condition of ACM in a building that affords public access or occupancy. These activities must be performed in accordance with current Federal and State of Georgia guidelines.

2.0 OBJECTIVE

The objective of ACES' inspections was to identify and sample suspect asbestos-containing materials within the structure. This report was prepared for the exclusive use of the client for specific application to the subject project. No warranties, either expressed or implied, are made or intended. The material contained herein shall not, in whole or part, be disseminated or conveyed to any other party or be used or relied upon by any other party, in whole or part, without ACES' written consent.

3.0 SITE DESCRIPTION

This inspection was performed on an unoccupied, single-story metal building containing offices, kitchen and a gymnasium and known to the client as Building #99. It is constructed on slab and covers approximately 7,200 square feet. Most floor areas are surfaced with gray pebble sheet vinyl flooring. The kitchen has a tile floor adhered to slab with black mastic. Walls are surfaced with finished drywall. Offices and smaller rooms have ceilings comprised of acoustic tiles suspended in a metal grid system. A mechanical room with access from the exterior was also inspected. Included in this inspection was an associated outbuilding that appears to be a pumphouse with a pit containing insulated water tanks.

This pit may access a steam tunnel. The water tanks are insulated with block insulation under metal shrouding.

4.0 INSPECTION PROTOCOL

Random samples of suspect asbestos materials were collected by an U.S. Environmental Protection Agency (USEPA) accredited asbestos inspector. Suspect materials were grouped into specific homogeneous areas using one of the following classifications: surfacing material, thermal system insulation, or miscellaneous materials. A surfacing material is sprayed, troweled-on, or otherwise applied to surfaces (i.e., fireproofing, ceiling texture). Thermal system insulation consists of material applied to pipes, fittings, boilers, breaching, tanks, ducts, or other structural components to prevent heat loss or gain. Miscellaneous materials consist of items such as flooring, ceiling tiles, roofing materials, and cement board. In the course of an inspection the inspector randomly collects samples that are assessed for friability, accessibility, condition, damage potential, and relation to the ventilation system.

The inspector, using a knife, chisel, or coring tool, collected bulk samples of suspect materials. Prior to sampling, when required, the suspect material was sprayed with a surfactant to reduce fiber release. Samples collected were assigned a unique sample ID number and placed in a sealed container. Samples were sent to McCall & Spero Environmental, Inc., a NVLAP accredited laboratory (101895-0) and analyzed for asbestos content by Polarized Light Microscopy (PLM) coupled with dispersion staining techniques, in accordance with USEPA Method 40 CFR, Chapter 1, Part 763, Subpart F, Appendix A. The percentage of asbestos, where applicable, was determined by microscopic visual estimation.

Regulatory agencies (USEPA and OSHA) have defined ACM as a material containing greater than one percent asbestos. In order to define a material as non-ACM, a minimum number of samples must be collected and analyzed dependent upon the type and quantity of the homogeneous material. Additionally, samples determined to have an asbestos content of less than 10 per cent through PLM visual estimation (including those materials with an asbestos content of less than one percent) may either be assumed ACM or verified for asbestos content by point count analysis. A point count analysis is a statistical method for quantifying the percentage of asbestos in a material by PLM. Point counting was not within the scope of work for this project.

Asbestos materials are assessed as friable or non-friable. Friable materials, when dry, can be crumbled, pulverized or reduced to powder by hand pressure and have a higher potential for a fiber release than non-friable materials. Non-friable materials are materials that are firmly bound by plastic, cement, etc., and cannot be reduced to powder by hand pressure. The USEPA recommends that floor tile materials with no detectable asbestos through PLM analysis be verified through Transmission Electron Microscopy (TEM) analysis. Analysis utilizing TEM techniques was not performed at this time.

5.0 RESULTS

Thirty-three bulk samples were collected from the structure. However, due to multiple layers within some of those samples, a total of thirty-nine were analyzed by the laboratory. Table 1A is a listing of homogeneous materials for the project and Table 1B is a listing of analytical results for asbestos.

TABLE 1A
Building #99 and Associated Pumphouse
Veterans Cemetery Project
ECRH-Gracewood
Gracewood, GA
Homogeneous Areas

HA	Sample Location	Material Description	Category
HA-1	Large Room (Gym) Women's Bathroom Side Corridor At Front Door Side Office at Kitchen Rear Janitor's Office	Sheet Vinyl Flooring – gray pebble	Misc.
HA-2	Kitchen	Beige 12"x12" Floor Tile w/Black Mastic	Misc.
HA-3	Large Room, Debris Kitchen, Wall Women's Bathroom, Wall	Drywall	Misc.
HA-4	Large Room, Wall C Kitchen at Window Front Room, Wall B	Joint Compound	Misc.
HA-5	Corridor Kitchen Front Room	2'x2' Ceiling Tile w/red backing	Misc.
HA-6	Mechanical Room	4" dia. Pipe Insulation	TSI
HA-7	Mechanical Room	6" dia. Pipe Insulation	TSI
HA-8	Mechanical Room, Overhead Water Tank	Insulation Jacket	Misc.
HA-9	Pumphouse	Roofing Shingles w/Felt	Misc.
HA-10	Pumphouse, 2 Water Tanks	Block Insulation	TSI

LEGEND:
Misc. – Miscellaneous **Surf.** – Surfacing **TSI** – Thermal System Insulation
F – Friable **NF** – Non-friable

TABLE 1B
Building #99 and Associated Pumphouse
Veterans Cemetery Project
ECRH-Gracewood
Gracewood, GA
Asbestos Analysis Results

Sample ID	# of Samples	HA	Material Description	ACM Present	Type ACM	F/ NF
LC 1A-F	6	1	Sheet Vinyl Floor – gray pebble			NF
LC 2A-C	**3**	**2**	**Beige 12"x12" Floor Tile w/Black Mastic**	**YES**	**Chrysotile**	**NF**
LC 3A-C	3	3	Drywall	No		F
LC 4A-C	3	4	Joint Compound	No		F
LC 5A-C	3	5	2'x2' Ceiling Tile	No		F
LC 6A-C	3	6	4" dia. Pipe Insulation	No		F
LC 7A-C	3	7	6" dia. Pipe Insulation	No		F
LC 8A-C	3	8	Insulation Jacket	No		NF
LC 9A-C	3	9	Roofing Shingles w/Felt	No		NF
LC 10A-C	1	10	Block Insulation	No		F

6.0 CONCLUSIONS AND RECOMMENDATIONS

Inconclusive results would be results where the Polarized Light Microscopy analysis yielded a result of less than 1% asbestos. These materials would have to be treated as asbestos-containing material or point counted to determine their final status. There were no samples that contained inconclusive results.

In summary, the survey identified non-friable ACM in the structure. This material includes (quantities are approximate and are not intended for bidding purposes):

1. **The black mastic and, thus, the associated 12"x12" floor tile identified in the Kitchen was found to contain as much as 2% Chrysotile asbestos. This material is estimated to cover approximately 150 square feet.**

During this inspection, materials suspected to contain asbestos may have been identified but, due to their location or current use, were not sampled. These non-sampled suspect materials include, but are not limited to, physically inaccessible materials, and materials that when sampled would degrade the operation of their parent system or contribute to asbestos contamination of a building system. Examples of the last category include gaskets and dampers in ventilation systems, and boiler seals.

It is ACES' understanding the project is scheduled for demolition. Therefore, the identified asbestos-containing materials must be removed prior to any activity that would disturb the

material. A licensed asbestos abatement contractor using a licensed asbestos abatement supervisor/foreman and properly trained workers must be employed to perform the abatement. Additionally, an accredited project designer should design the abatement project and third-party air monitoring must be performed during abatement. Abatement must be performed in accordance with current Federal USEPA, OSHA, and State of Georgia guidelines.

This inspection was performed by Steve Connor, AHERA Inspector Certificate Number 20700 which is valid until October 17, 2026 and by Mark Franco, AHERA Inspector Certificate Number 25-6TLE1-SHAB (New York) which is valid until June 30, 2026.

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March 9, 2026

Client: 2KM Architects, Inc.
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Attn: Ms. Megan Poston, mposton@2kmarchitects.com

Project: Limited Lead Survey of Predominate Colors
Veterans Cemetery Project
Building #99 and Adjacent Pumphouse
East Central Regional Hospital – Gracewood
100 Myrtle Boulevard
Gracewood, GA
Report Number: 619-216-006

1.0 SCOPE

On February 26-27, 2026, a representative of Alternative Construction & Environmental Solutions, Inc. (ACES) conducted a lead-based paint survey at the above referenced property located on the Gracewood Campus of East Central Regional Hospital in Gracewood, Georgia. The purpose of this work was to identify existing lead levels in paint by X-ray Fluorescence (XRF).

2.0 SITE INSPECTION

A site inspection was performed to determine the current condition of the painted surfaces. Surfaces examined were found to be intact or chipping. At the client's request, this survey involved identifying the existence of lead-based paint on interior and exterior painted surfaces.

3.0 SAMPLING AND ANALYSIS

Sampling was accomplished utilizing a Sci Aps Model X550Pb XRF Lead Paint Analyzer with serial number 02471. All paint schemes were identified and readings were taken of each. All results are included in Attachment I as readings 86 through 111 and 153 through 164.

4.0 ATTACHMENTS

Attachment I XRF Measurements

5.0 CONCLUSION AND RECOMMENDATIONS

- There were no results greater than 1 mg/cm² which constitute lead-based paint according to HUD.

OSHA regulation 29 CFR 1926.62 requires employers to provide adequate protection to their workers that may be exposed to lead dust in excess of the action level of 30 micrograms per cubic meter of air. Where lead is present at any level of concentration, the Federal regulation requires employers to perform assessment exposure monitoring during any demolition/renovation activity that would create lead dust. If no employee is exposed to the action level during this initial assessment, further monitoring can be suspended. Although OSHA does not accept XRF as an absolute negative result, it has been utilized as an immediate indicator for work practices.

OSHA recognizes that Housing and Urban Development (HUD) and the Environmental Protection Agency (EPA) find XRF analyzers acceptable for analyzing lead in paint at their clearance level of 1.0 mg/cm^2. OSHA also recognizes that some instruments can measure accurately at substantially lower levels. However, while XRF analyzers may be an acceptable method of analysis for meeting HUD/EPA requirements, OSHA's concerns are different from those of HUD and EPA. OSHA's mission is to provide a safe and healthful working environment for American workers. To accomplish this task in the area of lead, OSHA relies primarily on airborne measurements to determine employee exposure. OSHA does not consider any method that relies solely on the analysis of bulk materials or surface content of lead (or other toxic material) to be acceptable for safely predicting employee exposure to airborne contaminants.

If any new or conflicting information becomes available at a later date, please advise ACES and any appropriate revisions and/or comments will be made. This report was prepared for the client and should not be reproduced, except in whole, and only with the written approval of ACES.

ALTERNATIVE CONSTRUCTION & ENVIRONMENTAL SOLUTIONS, INC.

Cliff Hampton
Manager
Industrial Hygiene, Safety & Health Dept.

Steve Connor
Project Manager

Attachment: XRF Readings

ALTERNATIVE CONSTRUCTION & ENVIRONMENTAL SOLUTIONS, INC.

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March 17, 2026

Client: 2KM Architects, Inc.
529 Greene Street
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Project: Pre-Demolition Asbestos Inspection
Veterans Cemetery Project
Building #100
East Central Regional Hospital – Gracewood
100 Myrtle Boulevard
Gracewood, GA
Report Number: 619-216-001

On February 26-27, 2026 and on March 11, 2026, representatives of Alternative Construction & Environmental Solutions, Inc., performed a pre-demolition asbestos inspection of the above referenced structure for the presence of asbestos-containing materials (ACM). Individuals who hold accreditation as AHERA Inspectors conducted the inspection.

Attached is a report of findings from the inspection. If you have any questions or need additional information, please feel free to give us a call.

ALTERNATIVE CONSTRUCTION & ENVIRONMENTAL SOLUTIONS, INC.

Cliff Hampton
Manager
Industrial Hygiene, Safety & Health Dept.

Steve Connor
Project Manager

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8. **Sketch, Photo and Marked Aerial Photograph**

1.0 EXECUTIVE SUMMARY

Representatives of Alternative Construction & Environmental Solutions, Inc., performed an asbestos inspection of a structure located on the Gracewood Campus of East Central Regional Hospital in Gracewood, Georgia on February 26-27, 2026 and on March 11, 2026. The purpose of the inspection was to determine if asbestos-containing materials would be encountered during demolition of the structure. Random samples of suspect materials were collected and analyzed for asbestos content.

It is ACES' understanding that the structure is scheduled for demolition. The asbestos inspection, therefore, was performed to comply with 29 CFR 1926.1101. During demolition, the identified friable ACM or non-friable ACM that might become friable during demolition must be abated prior to disturbance. A State of Georgia licensed asbestos contractor using a licensed supervisor/foreman and properly trained workers in accordance with a project design prepared by an accredited project designer must perform asbestos abatement. In addition, an air monitoring professional should perform third-party air monitoring during abatement. It is important to note that Federal and State regulations require a 10-day notification prior to any renovation/demolition activities that may impact the condition of ACM in a building that affords public access or occupancy. These activities must be performed in accordance with current Federal and State of Georgia guidelines.

2.0 OBJECTIVE

The objective of ACES' inspections was to identify and sample suspect asbestos-containing materials within the structure. This report was prepared for the exclusive use of the client for specific application to the subject project. No warranties, either expressed or implied, are made or intended. The material contained herein shall not, in whole or part, be disseminated or conveyed to any other party or be used or relied upon by any other party, in whole or part, without ACES' written consent.

3.0 SITE DESCRIPTION

This inspection was performed on an unoccupied, former dormitory building on the Gracewood Campus of East Central Regional Hospital in Gracewood, Georgia and known to the client as Building #100. The attached aerial photograph is marked to show this building. It was originally constructed circa 1958 of masonry on slab with a pitched, shingled roof and covers approximately 9,900 square feet. Floors throughout the building were identified as sheet vinyl on slab, terrazzo (dining hall) and ceramic tile (bathrooms/showers). Ceilings are comprised of acoustical tiles suspended within a metal grid system. All piping in the building that was identified by the inspectors was found to be insulated with fiberglass. Steam lines servicing the building via a steam tunnel were

found to be insulated with foam rock under metal shrouding. Building #100 is basically a mirrored (reversed duplication) image of Building #101 with very minor differences.

4.0 INSPECTION PROTOCOL

Random samples of suspect asbestos materials were collected by an U.S. Environmental Protection Agency (USEPA) accredited asbestos inspector. Suspect materials were grouped into specific homogeneous areas using one of the following classifications: surfacing material, thermal system insulation, or miscellaneous materials. A surfacing material is sprayed, troweled-on, or otherwise applied to surfaces (i.e., fireproofing, ceiling texture). Thermal system insulation consists of material applied to pipes, fittings, boilers, breaching, tanks, ducts, or other structural components to prevent heat loss or gain. Miscellaneous materials consist of items such as flooring, ceiling tiles, roofing materials, and cement board. In the course of an inspection the inspector randomly collects samples that are assessed for friability, accessibility, condition, damage potential, and relation to the ventilation system.

The inspector, using a knife, chisel, or coring tool, collected bulk samples of suspect materials. Prior to sampling, when required, the suspect material was sprayed with a surfactant to reduce fiber release. Samples collected were assigned a unique sample ID number and placed in a sealed container. Samples were sent to McCall & Spero Environmental, Inc., a NVLAP accredited laboratory (101895-0) and analyzed for asbestos content by Polarized Light Microscopy (PLM) coupled with dispersion staining techniques, in accordance with USEPA Method 40 CFR, Chapter 1, Part 763, Subpart F, Appendix A. The percentage of asbestos, where applicable, was determined by microscopic visual estimation.

Regulatory agencies (USEPA and OSHA) have defined ACM as a material containing greater than one percent asbestos. In order to define a material as non-ACM, a minimum number of samples must be collected and analyzed dependent upon the type and quantity of the homogeneous material. Additionally, samples determined to have an asbestos content of less than 10 per cent through PLM visual estimation (including those materials with an asbestos content of less than one percent) may either be assumed ACM or verified for asbestos content by point count analysis. A point count analysis is a statistical method for quantifying the percentage of asbestos in a material by PLM. Point counting was not within the scope of work for this project.

Asbestos materials are assessed as friable or non-friable. Friable materials, when dry, can be crumbled, pulverized or reduced to powder by hand pressure and have a higher potential for a fiber release than non-friable materials. Non-friable materials are materials that are firmly bound by plastic, cement, etc., and cannot be reduced to powder by hand pressure. The USEPA recommends that floor tile materials with no detectable asbestos through PLM analysis be verified through Transmission Electron Microscopy (TEM) analysis. Analysis utilizing TEM techniques was not performed at this time.

5.0 RESULTS

Forty-four bulk samples were collected from the structure. However, due to multiple layers within some of those samples, a total of forty-seven were analyzed by the laboratory. Table 1A is a listing of homogeneous materials for the project and Table 1B is a listing of analytical results for asbestos.

TABLE 1A
Building #100
Veterans Cemetery Project
ECRH-Gracewood
Gracewood, GA
Homogeneous Areas

HA	Sample Location	Material Description	Category
HA-1	Front Entry Porch Left Side Entry Porch Right Side Entry Porch	Flat Roof Cores	Misc.
HA-2	Main Roof	Roofing Shingles w/Felt	Misc.
HA-3	Metal-Framed Windows	Window Glazing	Misc.
HA-4	Exterior of Mechanical Room	Insulation on Steam Lines	TSI
HA-5	Exterior Water Supply Line	Fabric Insulation	TSI
HA-6	Mechanical Room Water Tank	Fabric Jacket	Misc.
HA-7	Wall Header of Screen Porch	Cementitious Panels	Misc.
HA-8	N-S Corridor Dining Room Lobby at Terrarium	2'x2' Ceiling Tile	Misc.
HA-9	Bathroom, N-S Wing Bathroom, E-W Wing	2'x2' Gypsum Ceiling Tile	Misc.
HA-10	Corridor, Above Ceiling Dispensary, Above Ceiling	Red HVAC Duct Mastic	Misc.
HA-11	At Pipe/Wall Penetrations	Rope Gasket	TSI
HA-12	E-W Corridor Dorm Area Kitchen Dorm Area Behind Dining Rm Hall at Dispensary SW Dorm Room w/Bath E-W Corridor	Sheet Vinyl Flooring – gray pebble	Misc.
HA-13	On Foam Rock Insulation Exterior Steam Lines	Black Mastic	Misc.
HA-14	N/A	Cementitious Ceiling Tiles	Misc.

LEGEND:
Misc. – Miscellaneous **Surf.** – Surfacing **TSI** – Thermal System Insulation
F – Friable **NF** – Non-friable

TABLE 1B
Building #100
Veterans Cemetery Project
ECRH-Gracewood
Gracewood, GA
Asbestos Analysis Results

Sample ID	# of Samples	HA	Material Description	ACM Present	Type ACM	F/ NF
LA 1A-C	3	1	Flat Roof Cores	No		NF
LA 2A-C	3	2	Roofing Shingles w/Felt	No		NF
LA 3A-C	3	3	Window Glazing	No		F
LA 4A-C	3	4	Elbow Insulation	No		F
LA 5A-C	3	5	Fabric Insulation	No		NF
LA 6A-C	3	6	Fabric Jacket	No		NF
LA 7A-C	**3**	**7**	**Cementitious Panels**	**YES**	**Chrysotile**	**NF**
LA 8A-C	3	8	2'x2' Acoustic Ceiling Tile	No		F
LA 9A-C	3	9	2'x2' Gypsum Ceiling Tile	No		F
LA 10A-C	3	10	Red HVAC Duct Mastic	No		NF
LA 11A-C	**3**	**11**	**Rope Packing**	**YES**	**Chrysotile**	**F**
LA 12A-G	7	12	Sheet Vinyl Flooring – gray pebble			NF
LA 13A-C	**3**	**13**	**Black Mastic**	**YES**	**Chrysotile**	**NF**
N/A	**0**	**13**	**Cementitious Ceiling Tiles**	**YES**	**PACM**	**NF**

6.0 CONCLUSIONS AND RECOMMENDATIONS

Inconclusive results would be results where the Polarized Light Microscopy analysis yielded a result of less than 1% asbestos. These materials would have to be treated as asbestos-containing material or point counted to determine their final status. There were no samples that contained inconclusive results.

In summary, the survey identified non-friable ACM in the structure. This material includes (quantities are approximate and are not intended for bidding purposes):

1. **The cementitious panels, otherwise known as Transite®, identified in the header above the exterior door of the screened-in porch were found to contain as much as 20% Chrysotile asbestos. This material is estimated to cover approximately 60 square feet.**

2. **The rope packing, identified at some places where pipes penetrate walls, was found to contain as much as 40% Chrysotile asbestos. The inspector did not estimate the quantity of this material. See photograph.**

3. **The black mastic identified at the seams of the foam rock insulation (under metal shroud) of the supply/return steam lines exterior of the mechanical room was found to contain as much as 10% Chrysotile asbestos. This material is estimated to involve approximately 2 linear feet of pipe above ground and should be assumed to be present throughout the steam tunnel.**

4. **The gray pebble sheet vinyl flooring identified throughout most of the building was found to contain as much as 15% Chrysotile asbestos. In some places, this material is present in two layers. Although these two layers have no visually discernable difference, the top layer was found to be non-ACM. Both layers should be considered ACM and must be treated accordingly. This material is estimated to cover approximately 6,914 square feet.**

- **Cementitious ceiling tiles, otherwise known as Transite®, were observed in a plumbing chase behind the bathroom wall (see sketch). The inspectors believe that the ceiling of the bathroom was originally comprised of these materials and that they were disposed over the wall into the chase. This material should be considered a Presumed Asbestos-Containing Material and must be treated accordingly. It is estimated that there is approximately 100 square feet of these tiles in the plumbing chase.**

During this inspection, materials suspected to contain asbestos may have been identified but, due to their location or current use, were not sampled. These non-sampled suspect materials include, but are not limited to, physically inaccessible materials, and materials that when sampled would degrade the operation of their parent system or contribute to asbestos contamination of a building system. Examples of the last category include gaskets and dampers in ventilation systems, and boiler seals.

It is ACES' understanding the project is scheduled for demolition. Therefore, the identified asbestos-containing materials must be removed prior to any activity that would disturb the material. A licensed asbestos abatement contractor using a licensed asbestos abatement supervisor/foreman and properly trained workers must be employed to perform the abatement. Additionally, an accredited project designer should design the abatement project and third-party air monitoring must be performed during abatement. Abatement must be performed in accordance with current Federal USEPA, OSHA, and State of Georgia guidelines.

This inspection was performed by Steve Connor, AHERA Inspector Certificate Number 20700 which is valid until October 17, 2026 and by Mark Franco, AHERA Inspector Certificate Number 25-6TLE1-SHAB (New York) which is valid until June 30, 2026.

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March 9, 2026

Client: 2KM Architects, Inc.
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Project: Limited Lead Survey of Predominate Colors
Veterans Cemetery Project
Building #100
East Central Regional Hospital – Gracewood
100 Myrtle Boulevard
Gracewood, GA
Report Number: 619-216-002

1.0 SCOPE

On February 26-27, 2026, a representative of Alternative Construction & Environmental Solutions, Inc. (ACES) conducted a lead-based paint survey at the above referenced property located on the Gracewood Campus of East Central Regional Hospital in Gracewood, Georgia. The purpose of this work was to identify existing lead levels in paint by X-ray Fluorescence (XRF).

2.0 SITE INSPECTION

A site inspection was performed to determine the current condition of the painted surfaces. Surfaces examined were found to be chipping. At the client's request, this survey involved identifying the existence of lead-based paint on interior and exterior painted surfaces.

3.0 SAMPLING AND ANALYSIS

Sampling was accomplished utilizing a Sci Aps Model X550Pb XRF Lead Paint Analyzer with serial number 02471. All paint schemes were identified and readings were taken of each. All results are included in Attachment I as readings 1 through 47.

4.0 ATTACHMENTS

Attachment I XRF Measurements

5.0 CONCLUSION AND RECOMMENDATIONS

The following contained positive results according to the HUD standard or greater than 1mg/cm^2 concentration of lead:

- **Readings taken of the interior and exterior, white, metal, window lintels were found to contain lead-based paint and must be treated accordingly.**

- **Readings taken of the exterior, black, metal porch ceilings were found to contain lead-based paint and must be treated accordingly.**

OSHA regulation 29 CFR 1926.62 requires employers to provide adequate protection to their workers that may be exposed to lead dust in excess of the action level of 30 micrograms per cubic meter of air. Where lead is present at any level of concentration, the Federal regulation requires employers to perform assessment exposure monitoring during any demolition/renovation activity that would create lead dust. If no employee is exposed to the action level during this initial assessment, further monitoring can be suspended. Although OSHA does not accept XRF as an absolute negative result, it has been utilized as an immediate indicator for work practices.

OSHA recognizes that Housing and Urban Development (HUD) and the Environmental Protection Agency (EPA) find XRF analyzers acceptable for analyzing lead in paint at their clearance level of 1.0 mg/cm^2. OSHA also recognizes that some instruments can measure accurately at substantially lower levels. However, while XRF analyzers may be an acceptable method of analysis for meeting HUD/EPA requirements, OSHA's concerns are different from those of HUD and EPA. OSHA's mission is to provide a safe and healthful working environment for American workers. To accomplish this task in the area of lead, OSHA relies primarily on airborne measurements to determine employee exposure. OSHA does not consider any method that relies solely on the analysis of bulk materials or surface content of lead (or other toxic material) to be acceptable for safely predicting employee exposure to airborne contaminants.

If any new or conflicting information becomes available at a later date, please advise ACES and any appropriate revisions and/or comments will be made. This report was prepared for the client and should not be reproduced, except in whole, and only with the written approval of ACES.

ALTERNATIVE CONSTRUCTION & ENVIRONMENTAL SOLUTIONS, INC.

Cliff Hampton
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March 12, 2026

Client: 2KM Architects, Inc.
529 Greene Street
Augusta, GA 30901
Attn: Ms. Megan Poston, mposton@2kmarchitects.com

Project: Pre-Demolition Asbestos Inspection
Veterans Cemetery Project
Building #101
East Central Regional Hospital – Gracewood
100 Myrtle Boulevard
Gracewood, GA
Report Number: 619-216-003

On February 26-27, 2026, representatives of Alternative Construction & Environmental Solutions, Inc., performed a pre-demolition asbestos inspection of the above referenced structure for the presence of asbestos-containing materials (ACM). Individuals who hold accreditation as AHERA Inspectors conducted the inspection.

Attached is a report of findings from the inspection. If you have any questions or need additional information, please feel free to give us a call.

ALTERNATIVE CONSTRUCTION & ENVIRONMENTAL SOLUTIONS, INC.

Cliff Hampton
Manager
Industrial Hygiene, Safety & Health Dept.

Steve Connor
Project Manager

Attachments

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1.0 EXECUTIVE SUMMARY

Representatives of Alternative Construction & Environmental Solutions, Inc., performed an asbestos inspection of a structure located on the Gracewood Campus of East Central Regional Hospital in Gracewood, Georgia on February 26-27, 2026. The purpose of the inspection was to determine if asbestos-containing materials would be encountered during demolition of the structure. Random samples of suspect materials were collected and analyzed for asbestos content.

It is ACES' understanding that the structure is scheduled for demolition. The asbestos inspection, therefore, was performed to comply with 29 CFR 1926.1101. During demolition, the identified friable ACM or non-friable ACM that might become friable during demolition must be abated prior to disturbance. A State of Georgia licensed asbestos contractor using a licensed supervisor/foreman and properly trained workers in accordance with a project design prepared by an accredited project designer must perform asbestos abatement. In addition, an air monitoring professional should perform third-party air monitoring during abatement. It is important to note that Federal and State regulations require a 10-day notification prior to any renovation/demolition activities that may impact the condition of ACM in a building that affords public access or occupancy. These activities must be performed in accordance with current Federal and State of Georgia guidelines.

2.0 OBJECTIVE

The objective of ACES' inspections was to identify and sample suspect asbestos-containing materials within the structure. This report was prepared for the exclusive use of the client for specific application to the subject project. No warranties, either expressed or implied, are made or intended. The material contained herein shall not, in whole or part, be disseminated or conveyed to any other party or be used or relied upon by any other party, in whole or part, without ACES' written consent.

3.0 SITE DESCRIPTION

This inspection was performed on an unoccupied, former dormitory building on the Gracewood Campus of East Central Regional Hospital in Gracewood, Georgia and known to the client as Building #101. The attached aerial photograph is marked to show this building. It was originally constructed circa 1958 of masonry on slab with a pitched, shingled roof and covers approximately 9,900 square feet. Floors throughout the building were identified as sheet vinyl on slab, terrazzo (dining hall) and ceramic tile (bathrooms/showers). Ceilings are comprised of acoustical or gypsum tiles suspended within a metal grid system. The bathroom/shower room located closest to the Dining Room has a ceiling comprised of cementitious tiles (Transite®). All piping in the building that was identified by the inspectors was found to be insulated with fiberglass. Steam lines servicing the building via a steam tunnel were found to be insulated with foam rock under metal shrouding. This building is full of laundry carts and is flooded with 1-2 inches of

water making access difficult. Building #101 is basically a mirrored (reversed duplication) image of Building #100 with very minor differences.

4.0 INSPECTION PROTOCOL

Random samples of suspect asbestos materials were collected by an U.S. Environmental Protection Agency (USEPA) accredited asbestos inspector. Suspect materials were grouped into specific homogeneous areas using one of the following classifications: surfacing material, thermal system insulation, or miscellaneous materials. A surfacing material is sprayed, troweled-on, or otherwise applied to surfaces (i.e., fireproofing, ceiling texture). Thermal system insulation consists of material applied to pipes, fittings, boilers, breaching, tanks, ducts, or other structural components to prevent heat loss or gain. Miscellaneous materials consist of items such as flooring, ceiling tiles, roofing materials, and cement board. In the course of an inspection the inspector randomly collects samples that are assessed for friability, accessibility, condition, damage potential, and relation to the ventilation system.

The inspector, using a knife, chisel, or coring tool, collected bulk samples of suspect materials. Prior to sampling, when required, the suspect material was sprayed with a surfactant to reduce fiber release. Samples collected were assigned a unique sample ID number and placed in a sealed container. Samples were sent to McCall & Spero Environmental, Inc., a NVLAP accredited laboratory (101895-0) and analyzed for asbestos content by Polarized Light Microscopy (PLM) coupled with dispersion staining techniques, in accordance with USEPA Method 40 CFR, Chapter 1, Part 763, Subpart F, Appendix A. The percentage of asbestos, where applicable, was determined by microscopic visual estimation.

Regulatory agencies (USEPA and OSHA) have defined ACM as a material containing greater than one percent asbestos. In order to define a material as non-ACM, a minimum number of samples must be collected and analyzed dependent upon the type and quantity of the homogeneous material. Additionally, samples determined to have an asbestos content of less than 10 per cent through PLM visual estimation (including those materials with an asbestos content of less than one percent) may either be assumed ACM or verified for asbestos content by point count analysis. A point count analysis is a statistical method for quantifying the percentage of asbestos in a material by PLM. Point counting was not within the scope of work for this project.

Asbestos materials are assessed as friable or non-friable. Friable materials, when dry, can be crumbled, pulverized or reduced to powder by hand pressure and have a higher potential for a fiber release than non-friable materials. Non-friable materials are materials that are firmly bound by plastic, cement, etc., and cannot be reduced to powder by hand pressure. The USEPA recommends that floor tile materials with no detectable asbestos through PLM analysis be verified through Transmission Electron Microscopy (TEM) analysis. Analysis utilizing TEM techniques was not performed at this time.

5.0 RESULTS

Thirty-three bulk samples were collected from the structure. However, due to multiple layers within some of those samples, a total of thirty-nine were analyzed by the laboratory. Table 1A is a listing of homogeneous materials for the project and Table 1B is a listing of analytical results for asbestos.

TABLE 1A
Building #101
Veterans Cemetery Project
ECRH-Gracewood
Gracewood, GA
Homogeneous Areas

HA	Sample Location	Material Description	Category
HA-1	Side D Porch Side B Porch Front Entry Porch	Flat Roof Cores	Misc.
HA-2	Main Roof	Roofing Shingles w/Felt	Misc.
HA-3	Metal-Framed Windows	Window Glazing	Misc.
HA-4	On Foam Rock Insulation of Steam Lines	Black Mastic	Misc.
HA-5	Kitchen N-S Corridor Dorm Area	Sheet Vinyl Flooring – gray pebble	Misc.
HA-6	E-W Corridor Foyer/Front Entrance Dining Room	2'x2' Acoustic Ceiling Tile	Misc.
HA-7	Shower Room	2'x2' Gypsum Ceiling Tile	Misc.
HA-8	Fiberglass Duct Insulation Above Ceiling	White HVAC Duct Mastic	Misc.
HA-9	Hard Duct Above Ceiling	Red HVAC Duct Mastic	Misc.
HA-10	Bathroom at Dining Room	Cementitious Ceiling Tile	Misc.
HA-11	Water Tank in Mech Room	Fabric Jacket w/White Mastic	Misc.

LEGEND:
Misc. – Miscellaneous **Surf.** – Surfacing **TSI** – Thermal System Insulation
F – Friable **NF** – Non-friable

TABLE 1B
Building #101
Veterans Cemetery Project
ECRH-Gracewood
Gracewood, GA
Asbestos Analysis Results

Sample ID	# of Samples	HA	Material Description	ACM Present	Type ACM	F/ NF
LB 1A-C	3	1	Flat Roof Cores	No		NF
LB 2A-C	3	2	Roofing Shingles w/Felt	No		NF
LB 3A-C	3	3	Window Glazing	No		F
LB 4A-C	**3**	**4**	**Black Mastic**	**YES**	**Chrysotile**	**NF**
LB 5A-C	**3**	**5**	**Sheet Vinyl Flooring – gray pebble**	**YES**	**Chrysotile**	**NF**
LB 6A-C	3	6	2'x2' Acoustic Ceiling Tile	No		F
LB 7A-C	3	7	2'x2' Gypsum Ceiling Tile	No		F
LB 8A-C	3	8	White HVAC Duct Mastic	No		NF
LB 9A-C	3	9	Red HVAC Duct Mastic	No		NF
LB 10A-C	**1**	**10**	**Cementitious Ceiling Tile**	**YES**	**Chrysotile**	**NF**
LB 11A-C	3	11	Fabric Jacket w/Mastic	No		NF

6.0 CONCLUSIONS AND RECOMMENDATIONS

Inconclusive results would be results where the Polarized Light Microscopy analysis yielded a result of less than 1% asbestos. These materials would have to be treated as asbestos-containing material or point counted to determine their final status. There were no samples that contained inconclusive results.

In summary, the survey identified non-friable ACM in the structure. This material includes (quantities are approximate and are not intended for bidding purposes):

1. **The black mastic identified at the seams of the foam rock insulation (under metal shroud) of the steam lines exterior of the mechanical room was found to contain as much as 10% Chrysotile asbestos. This material is estimated to involve approximately 2 linear feet of pipe above ground and should be assumed to be present throughout the steam tunnel.**

2. **The gray pebble sheet vinyl flooring identified throughout most of the building was found to contain as much as 10% Chrysotile asbestos. This material is estimated to cover approximately 6,914 square feet.**

3. **Cementitious ceiling tiles, otherwise known as Transite®, were identified in one of the bath/shower rooms (closest to Dining Room). This material is estimated to cover approximately 450 square feet.**

During this inspection, materials suspected to contain asbestos may have been identified but, due to their location or current use, were not sampled. These non-sampled suspect materials include, but are not limited to, physically inaccessible materials, and materials that when sampled would degrade the operation of their parent system or contribute to asbestos contamination of a building system. Examples of the last category include gaskets and dampers in ventilation systems, and boiler seals.

It is ACES' understanding the project is scheduled for demolition. Therefore, the identified asbestos-containing materials must be removed prior to any activity that would disturb the material. A licensed asbestos abatement contractor using a licensed asbestos abatement supervisor/foreman and properly trained workers must be employed to perform the abatement. Additionally, an accredited project designer should design the abatement project and third-party air monitoring must be performed during abatement. Abatement must be performed in accordance with current Federal USEPA, OSHA, and State of Georgia guidelines.

This inspection was performed by Steve Connor, AHERA Inspector Certificate Number 20700 which is valid until October 17, 2026 and by Mark Franco, AHERA Inspector Certificate Number 25-6TLE1-SHAB (New York) which is valid until June 30, 2026.

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March 12, 2026

Client: 2KM Architects, Inc.
529 Greene Street
Augusta, GA 30901
Attn: Ms. Megan Poston, mposton@2kmarchitects.com

Project: Limited Lead Survey of Predominate Colors
Veterans Cemetery Project
Building #101
East Central Regional Hospital – Gracewood
100 Myrtle Boulevard
Gracewood, GA
Report Number: 619-216-004

1.0 SCOPE

On February 26-27, 2026, a representative of Alternative Construction & Environmental Solutions, Inc. (ACES) conducted a lead-based paint survey at the above referenced property located on the Gracewood Campus of East Central Regional Hospital in Gracewood, Georgia. The purpose of this work was to identify existing lead levels in paint by X-ray Fluorescence (XRF).

2.0 SITE INSPECTION

A site inspection was performed to determine the current condition of the painted surfaces. Surfaces examined were found to be chipping. At the client's request, this survey involved identifying the existence of lead-based paint on interior and exterior painted surfaces.

3.0 SAMPLING AND ANALYSIS

Sampling was accomplished utilizing a Sci Aps Model X550Pb XRF Lead Paint Analyzer with serial number 02471. All paint schemes were identified and readings were taken of each. All results are included in Attachment I as readings 48 through 85.

4.0 ATTACHMENTS

Attachment I XRF Measurements

5.0 CONCLUSION AND RECOMMENDATIONS

The following contained positive results according to the HUD standard or greater than 1mg/cm^2 concentration of lead:

- **Readings taken of the interior, white, concrete walls of the hallways, kitchen and patient rooms were found to contain lead-based paint and must be treated accordingly.**

- **Readings taken of the interior, white, metal I-beams of the ceiling deck were found to contain lead-based paint and must be treated accordingly.**

OSHA regulation 29 CFR 1926.62 requires employers to provide adequate protection to their workers that may be exposed to lead dust in excess of the action level of 30 micrograms per cubic meter of air. Where lead is present at any level of concentration, the Federal regulation requires employers to perform assessment exposure monitoring during any demolition/renovation activity that would create lead dust. If no employee is exposed to the action level during this initial assessment, further monitoring can be suspended. Although OSHA does not accept XRF as an absolute negative result, it has been utilized as an immediate indicator for work practices.

OSHA recognizes that Housing and Urban Development (HUD) and the Environmental Protection Agency (EPA) find XRF analyzers acceptable for analyzing lead in paint at their clearance level of 1.0 mg/cm^2. OSHA also recognizes that some instruments can measure accurately at substantially lower levels. However, while XRF analyzers may be an acceptable method of analysis for meeting HUD/EPA requirements, OSHA's concerns are different from those of HUD and EPA. OSHA's mission is to provide a safe and healthful working environment for American workers. To accomplish this task in the area of lead, OSHA relies primarily on airborne measurements to determine employee exposure. OSHA does not consider any method that relies solely on the analysis of bulk materials or surface content of lead (or other toxic material) to be acceptable for safely predicting employee exposure to airborne contaminants.

If any new or conflicting information becomes available at a later date, please advise ACES and any appropriate revisions and/or comments will be made. This report was prepared for the client and should not be reproduced, except in whole, and only with the written approval of ACES.

ALTERNATIVE CONSTRUCTION & ENVIRONMENTAL SOLUTIONS, INC.

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March 12, 2026

Client: 2KM Architects, Inc.
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Attn: Ms. Megan Poston, mposton@2kmarchitects.com

Project: Pre-Demolition Asbestos Inspection
Veterans Cemetery Project
Quonset Hut Building (Former Employee Training)
East Central Regional Hospital – Gracewood
100 Myrtle Boulevard
Gracewood, GA
Report Number: 619-216-007

On February 26-27, 2026, representatives of Alternative Construction & Environmental Solutions, Inc., performed a pre-demolition asbestos inspection of the above referenced structure for the presence of asbestos-containing materials (ACM). Individuals who hold accreditation as AHERA Inspectors conducted the inspection.

Attached is a report of findings from the inspection. If you have any questions or need additional information, please feel free to give us a call.

ALTERNATIVE CONSTRUCTION & ENVIRONMENTAL SOLUTIONS, INC.

Cliff Hampton
Manager
Industrial Hygiene, Safety & Health Dept.

Steve Connor
Project Manager

Attachments

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8. **Photo and Marked Aerial Photograph**

1.0 EXECUTIVE SUMMARY

Representatives of Alternative Construction & Environmental Solutions, Inc., performed an asbestos inspection of a structure located on the Gracewood Campus of East Central Regional Hospital in Gracewood, Georgia on February 26-27, 2026. The purpose of the inspection was to determine if asbestos-containing materials would be encountered during demolition of the structure. Random samples of suspect materials were collected and analyzed for asbestos content.

It is ACES' understanding that the structure is scheduled for demolition. The asbestos inspection, therefore, was performed to comply with 29 CFR 1926.1101. During demolition, the identified friable ACM or non-friable ACM that might become friable during demolition must be abated prior to disturbance. A State of Georgia licensed asbestos contractor using a licensed supervisor/foreman and properly trained workers in accordance with a project design prepared by an accredited project designer must perform asbestos abatement. In addition, an air monitoring professional should perform third-party air monitoring during abatement. It is important to note that Federal and State regulations require a 10-day notification prior to any renovation/demolition activities that may impact the condition of ACM in a building that affords public access or occupancy. These activities must be performed in accordance with current Federal and State of Georgia guidelines.

2.0 OBJECTIVE

The objective of ACES' inspections was to identify and sample suspect asbestos-containing materials within the structure. This report was prepared for the exclusive use of the client for specific application to the subject project. No warranties, either expressed or implied, are made or intended. The material contained herein shall not, in whole or part, be disseminated or conveyed to any other party or be used or relied upon by any other party, in whole or part, without ACES' written consent.

3.0 SITE DESCRIPTION

This inspection was performed on an unoccupied, Quonset Hut-style building that was, reportedly, previously purposed for employee training. It has a footprint of approximately 7,200 square feet and is constructed of semicircular corrugated galvanized metal with a gray coating. Sprayed fireproofing has been applied to the entire underside of the arched walls/ceilings and trusses. This fireproofing is in very poor condition and has delaminated onto the floor and all contents of the building. A cementitious ceiling, otherwise known as Transite®, was identified in the front mechanical room. This ceiling has collapsed and the material has been rendered friable. A 4ft. long overhead water tank, identified in this front

mechanical room, could not be accessed for sampling. A rear mechanical room was also inspected and sampled.

4.0 INSPECTION PROTOCOL

Random samples of suspect asbestos materials were collected by an U.S. Environmental Protection Agency (USEPA) accredited asbestos inspector. Suspect materials were grouped into specific homogeneous areas using one of the following classifications: surfacing material, thermal system insulation, or miscellaneous materials. A surfacing material is sprayed, troweled-on, or otherwise applied to surfaces (i.e., fireproofing, ceiling texture). Thermal system insulation consists of material applied to pipes, fittings, boilers, breaching, tanks, ducts, or other structural components to prevent heat loss or gain. Miscellaneous materials consist of items such as flooring, ceiling tiles, roofing materials, and cement board. In the course of an inspection the inspector randomly collects samples that are assessed for friability, accessibility, condition, damage potential, and relation to the ventilation system.

The inspector, using a knife, chisel, or coring tool, collected bulk samples of suspect materials. Prior to sampling, when required, the suspect material was sprayed with a surfactant to reduce fiber release. Samples collected were assigned a unique sample ID number and placed in a sealed container. Samples were sent to McCall & Spero Environmental, Inc., a NVLAP accredited laboratory (101895-0) and analyzed for asbestos content by Polarized Light Microscopy (PLM) coupled with dispersion staining techniques, in accordance with USEPA Method 40 CFR, Chapter 1, Part 763, Subpart F, Appendix A. The percentage of asbestos, where applicable, was determined by microscopic visual estimation.

Regulatory agencies (USEPA and OSHA) have defined ACM as a material containing greater than one percent asbestos. In order to define a material as non-ACM, a minimum number of samples must be collected and analyzed dependent upon the type and quantity of the homogeneous material. Additionally, samples determined to have an asbestos content of less than 10 per cent through PLM visual estimation (including those materials with an asbestos content of less than one percent) may either be assumed ACM or verified for asbestos content by point count analysis. A point count analysis is a statistical method for quantifying the percentage of asbestos in a material by PLM. Point counting was not within the scope of work for this project.

Asbestos materials are assessed as friable or non-friable. Friable materials, when dry, can be crumbled, pulverized or reduced to powder by hand pressure and have a higher potential for a fiber release than non-friable materials. Non-friable materials are materials that are firmly bound by plastic, cement, etc., and cannot be reduced to powder by hand pressure. The USEPA recommends that floor tile materials with no detectable asbestos through PLM analysis be verified through Transmission Electron Microscopy (TEM) analysis. Analysis utilizing TEM techniques was not performed at this time.

5.0 RESULTS

Thirty-four bulk samples were collected from the structure and were analyzed by the laboratory. Table 1A is a listing of homogeneous materials for the project and Table 1B is a listing of analytical results for asbestos.

TABLE 1A
Quonset Hut Building
Veterans Cemetery Project
ECRH-Gracewood
Gracewood, GA
Homogeneous Areas

HA	Sample Location	Material Description	Category
HA-1	Roof, Front Roof, Back Rear Wall	Gray/Silver Roof Coating	Misc.
HA-2	Base of Roof/Brick Wall	Tar/Caulk	Misc.
HA-3	Front Bathrooms Front Mechanical Room	2" dia. Hard Elbows	TSI
HA-4	Rear Mechanical Room Above Rear Ceiling Front Mechanical Room	4" dia. Hard Elbows	TSI
HA-5	Rear Mechanical Room Above Rear Ceiling Front Mechanical Room, Debris	6" dia. Hard Elbows	TSI
HA-6	Rear Mechanical Room	Valve Insulation	TSI
HA-7	Front Windows	Window Glazing	Misc.
HA-8	Front Room, Debris on Desk Front Room, Debris on Floor Front Entrance, Left Side Wall Front Bathroom, Ceiling Rear Locker L, Wall Rear Locker R, Wall Rear Room at Mech. Room	Spray-Applied Fireproofing	Surf.
HA-9	Rear Room, Left Rear Room, Right	Sheet Vinyl Flooring – gray pebble	Misc.
HA-10	Front Door Front Window Rear Door	Door/Window Caulking	Misc.
HA-11	N/A	Cementitious Panels	Misc.
HA-12	N/A	Water Tank Insulation	TSI

LEGEND:
Misc. – Miscellaneous **Surf.** – Surfacing **TSI** – Thermal System Insulation
F – Friable **NF** – Non-friable

TABLE 1B
Quonset Hut Building
Veterans Cemetery Project
ECRH-Gracewood
Gracewood, GA
Asbestos Analysis Results

Sample ID	# of Samples	HA	Material Description	ACM Present	Type ACM	F/ NF
LD 1A-C	3	1	Gray/Silver Coating	No		NF
LD 2A-C	**3**	**2**	**Black Tar/Caulk**	**YES**	**Chrysotile**	**NF**
LD 3A-C	3	3	2" Hard Elbows	No		F
LD 4A-C	3	4	4" Hard Elbows	No		F
LD 5A-C	3	5	6" Hard Elbows	No		F
LD 6A-C	3	6	Valve Insulation	No		F
LD 7A-C	3	7	Window Glazing	No		F
LD 8A-G	**7**	**8**	**Spray-Applied Fireproofing**	**YES**	**Chrysotile**	**F**
LD 9A-C	**3**	**9**	**Sheet Vinyl Flooring – gray pebble**	**YES**	**Chrysotile**	**NF**
LD 10A-C	**3**	**10**	**Door/Window Caulking**	**YES**	**Chrysotile**	**F**
N/A	**0**	**11**	**Cementitious Panels**	**YES**	**PACM**	**F**
N/A	**0**	**12**	**Water Tank Insulation**	**YES**	**PACM**	**F**

6.0 CONCLUSIONS AND RECOMMENDATIONS

Inconclusive results would be results where the Polarized Light Microscopy analysis yielded a result of less than 1% asbestos. These materials would have to be treated as asbestos-containing material or point counted to determine their final status. There were no samples that contained inconclusive results.

In summary, the survey identified friable and non-friable ACM in the structure. This material includes (quantities are approximate and are not intended for bidding purposes):

1. **The black tar/caulk identified at the base of the arched walls where they intersect the brick base (see photograph) was found to contain as much as 2% Chrysotile asbestos. This material is estimated to involve approximately 240 linear feet.**

2. **The spray-applied fireproofing identified on the entire underside of the semicircular walls/ceilings and as delaminated debris throughout the structure was found to contain as much as 30% Chrysotile asbestos. This material was originally sprayed on a surface covering approximately 12,500 square feet.**

3. **The gray pebble sheet vinyl flooring identified in the Rear Left Room and the Rear Right Room was found to contain as much as 10% Chrysotile asbestos. This material is estimated to cover approximately 1,380 square feet.**

4. **Caulking around the Front Door, Front Window and Rear Door were found to contain as much as 3% Chrysotile asbestos.**

- **Due the fact that the fireproofing material has delaminated into the structure onto the entire contents of the building including furniture, papers, framing, etc. and that the PACM Transite® ceiling has collapsed within the structure, the entire contents of this building or the entire building itself should be considered Presumed Asbestos-Containing Material and must be treated accordingly. No one should enter this building for any reason without protective clothing and properly filtered, fitted respirator within an approved respiratory protection program. Powered Air Purifying Respirators should be worn unless a Negative Exposure Assessment proves otherwise.**

During this inspection, materials suspected to contain asbestos may have been identified but, due to their location or current use, were not sampled. These non-sampled suspect materials include, but are not limited to, physically inaccessible materials, and materials that when sampled would degrade the operation of their parent system or contribute to asbestos contamination of a building system. Examples of the last category include gaskets and dampers in ventilation systems, and boiler seals.

It is ACES' understanding the project is scheduled for demolition. Therefore, the identified asbestos-containing materials must be removed prior to any activity that would disturb the material. A licensed asbestos abatement contractor using a licensed asbestos abatement supervisor/foreman and properly trained workers must be employed to perform the abatement. Additionally, an accredited project designer should design the abatement project and third-party air monitoring must be performed during abatement. Abatement must be performed in accordance with current Federal USEPA, OSHA, and State of Georgia guidelines.

This inspection was performed by Steve Connor, AHERA Inspector Certificate Number 20700 which is valid until October 17, 2026 and by Mark Franco, AHERA Inspector Certificate Number 25-6TLE1-SHAB (New York) which is valid until June 30, 2026.

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March 12, 2026

Client: 2KM Architects, Inc.
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Project: Limited Lead Survey of Predominate Colors
Veterans Cemetery Project
Quonset Hut Building
East Central Regional Hospital – Gracewood
100 Myrtle Boulevard
Gracewood, GA
Report Number: 619-216-008

1.0 SCOPE

On February 26-27, 2026, a representative of Alternative Construction & Environmental Solutions, Inc. (ACES) conducted a lead-based paint survey at the above referenced property located on the Gracewood Campus of East Central Regional Hospital in Gracewood, Georgia. The purpose of this work was to identify existing lead levels in paint by X-ray Fluorescence (XRF).

2.0 SITE INSPECTION

A site inspection was performed to determine the current condition of the painted surfaces. Surfaces examined were found to be chipping. At the client's request, this survey involved identifying the existence of lead-based paint on interior and exterior painted surfaces.

3.0 SAMPLING AND ANALYSIS

Sampling was accomplished utilizing a Sci Aps Model X550Pb XRF Lead Paint Analyzer with serial number 02471. All paint schemes were identified and readings were taken of each. All results are included in Attachment I as readings 112 through 152.

4.0 ATTACHMENTS

Attachment I XRF Measurements

5.0 CONCLUSION AND RECOMMENDATIONS

The following contained positive results according to the HUD standard or greater than 1mg/cm² concentration of lead:

- **Readings taken of the interior, white, metal, doors and door casings were found to contain lead-based paint and must be treated accordingly.**
- **Readings taken of the interior, green, metal, door casings were found to contain lead-based paint and must be treated accordingly.**
- **Readings taken of the interior, brown, metal, door casings were found to contain lead-based paint and must be treated accordingly.**
- **Readings taken of the interior, red, metal, door casings were found to contain lead-based paint and must be treated accordingly.**
- **Readings taken of the interior, gray, metal, doors and door casings were found to contain lead-based paint and must be treated accordingly.**

OSHA regulation 29 CFR 1926.62 requires employers to provide adequate protection to their workers that may be exposed to lead dust in excess of the action level of 30 micrograms per cubic meter of air. Where lead is present at any level of concentration, the Federal regulation requires employers to perform assessment exposure monitoring during any demolition/renovation activity that would create lead dust. If no employee is exposed to the action level during this initial assessment, further monitoring can be suspended. Although OSHA does not accept XRF as an absolute negative result, it has been utilized as an immediate indicator for work practices.

OSHA recognizes that Housing and Urban Development (HUD) and the Environmental Protection Agency (EPA) find XRF analyzers acceptable for analyzing lead in paint at their clearance level of 1.0 mg/cm^2. OSHA also recognizes that some instruments can measure accurately at substantially lower levels. However, while XRF analyzers may be an acceptable method of analysis for meeting HUD/EPA requirements, OSHA's concerns are different from those of HUD and EPA. OSHA's mission is to provide a safe and healthful working environment for American workers. To accomplish this task in the area of lead, OSHA relies primarily on airborne measurements to determine employee exposure. OSHA does not consider any method that relies solely on the analysis of bulk materials or surface content of lead (or other toxic material) to be acceptable for safely predicting employee exposure to airborne contaminants.

If any new or conflicting information becomes available at a later date, please advise ACES and any appropriate revisions and/or comments will be made. This report was prepared for the client and should not be reproduced, except in whole, and only with the written approval of ACES.

ALTERNATIVE CONSTRUCTION & ENVIRONMENTAL SOLUTIONS, INC.

Cliff Hampton
Manager
Industrial Hygiene, Safety & Health Dept.

Steve Connor
Project Manager

ALTERNATIVE CONSTRUCTION & ENVIRONMENTAL SOLUTIONS, INC.

2247 Wrightsboro Road
Augusta, GA 30904

Mailing Address: PO Box 3229, Augusta, GA 30914-3229
Telephone: 706-262-2000 • Facsimile: 706-262-3299 • www.aces-usa.com

March 12, 2026

Client: 2KM Architects, Inc.
529 Greene Street
Augusta, GA 30901
Attn: Ms. Megan Poston, mposton@2kmarchitects.com

Project: Pre-Demolition Asbestos Inspection
Veterans Cemetery Project
Picnic Pavilion and Associated Brick Bathroom Bldg
East Central Regional Hospital – Gracewood
100 Myrtle Boulevard
Gracewood, GA
Report Number: 619-216-009

On February 26-27, 2026, representatives of Alternative Construction & Environmental Solutions, Inc., performed a pre-demolition asbestos inspection of the above referenced structure for the presence of asbestos-containing materials (ACM). Individuals who hold accreditation as AHERA Inspectors conducted the inspection.

Attached is a report of findings from the inspection. If you have any questions or need additional information, please feel free to give us a call.

ALTERNATIVE CONSTRUCTION & ENVIRONMENTAL SOLUTIONS, INC.

Cliff Hampton
Manager
Industrial Hygiene, Safety & Health Dept.

Steve Connor
Project Manager

Attachments

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2. **Objective**
3. **Site Description**
4. **Inspection Protocol**
5. **Results**
6. **Conclusion and Recommendations**
7. **Laboratory Analysis Sheets and Chains of Custody**
8. **Marked Aerial Photograph**

1.0 EXECUTIVE SUMMARY

Representatives of Alternative Construction & Environmental Solutions, Inc., performed an asbestos inspection of a structure located on the Gracewood Campus of East Central Regional Hospital in Gracewood, Georgia on February 26-27, 2026. The purpose of the inspection was to determine if asbestos-containing materials would be encountered during demolition of the structure. Random samples of suspect materials were collected and analyzed for asbestos content.

It is ACES' understanding that the structure is scheduled for demolition. The asbestos inspection, therefore, was performed to comply with 29 CFR 1926.1101. During demolition, the identified friable ACM or non-friable ACM that might become friable during demolition must be abated prior to disturbance. A State of Georgia licensed asbestos contractor using a licensed supervisor/foreman and properly trained workers in accordance with a project design prepared by an accredited project designer must perform asbestos abatement. In addition, an air monitoring professional should perform third-party air monitoring during abatement. It is important to note that Federal and State regulations require a 10-day notification prior to any renovation/demolition activities that may impact the condition of ACM in a building that affords public access or occupancy. These activities must be performed in accordance with current Federal and State of Georgia guidelines.

2.0 OBJECTIVE

The objective of ACES' inspections was to identify and sample suspect asbestos-containing materials within the structure. This report was prepared for the exclusive use of the client for specific application to the subject project. No warranties, either expressed or implied, are made or intended. The material contained herein shall not, in whole or part, be disseminated or conveyed to any other party or be used or relied upon by any other party, in whole or part, without ACES' written consent.

3.0 SITE DESCRIPTION

This inspection was performed on a wooden picnic pavilion and associated, brick bathroom building located on the campus of East Central Regional Hospital's Gracewood campus. Please see the attached marked aerial photograph for location.

4.0 INSPECTION PROTOCOL

Random samples of suspect asbestos materials were collected by an U.S. Environmental Protection Agency (USEPA) accredited asbestos inspector. Suspect materials were grouped into specific homogeneous areas using one of the following classifications: surfacing material, thermal system insulation, or miscellaneous materials. A surfacing material is sprayed, troweled-on, or otherwise applied to surfaces (i.e., fireproofing, ceiling texture). Thermal system insulation consists of material applied to pipes, fittings, boilers, breaching, tanks, ducts, or other structural components to prevent heat loss or gain. Miscellaneous materials consist of items such as flooring, ceiling tiles, roofing materials, and cement

board. In the course of an inspection the inspector randomly collects samples that are assessed for friability, accessibility, condition, damage potential, and relation to the ventilation system.

The inspector, using a knife, chisel, or coring tool, collected bulk samples of suspect materials. Prior to sampling, when required, the suspect material was sprayed with a surfactant to reduce fiber release. Samples collected were assigned a unique sample ID number and placed in a sealed container. Samples were sent to McCall & Spero Environmental, Inc., a NVLAP accredited laboratory (101895-0) and analyzed for asbestos content by Polarized Light Microscopy (PLM) coupled with dispersion staining techniques, in accordance with USEPA Method 40 CFR, Chapter 1, Part 763, Subpart F, Appendix A. The percentage of asbestos, where applicable, was determined by microscopic visual estimation.

Regulatory agencies (USEPA and OSHA) have defined ACM as a material containing greater than one percent asbestos. In order to define a material as non-ACM, a minimum number of samples must be collected and analyzed dependent upon the type and quantity of the homogeneous material. Additionally, samples determined to have an asbestos content of less than 10 per cent through PLM visual estimation (including those materials with an asbestos content of less than one percent) may either be assumed ACM or verified for asbestos content by point count analysis. A point count analysis is a statistical method for quantifying the percentage of asbestos in a material by PLM. Point counting was not within the scope of work for this project.

Asbestos materials are assessed as friable or non-friable. Friable materials, when dry, can be crumbled, pulverized or reduced to powder by hand pressure and have a higher potential for a fiber release than non-friable materials. Non-friable materials are materials that are firmly bound by plastic, cement, etc., and cannot be reduced to powder by hand pressure. The USEPA recommends that floor tile materials with no detectable asbestos through PLM analysis be verified through Transmission Electron Microscopy (TEM) analysis. Analysis utilizing TEM techniques was not performed at this time.

5.0 RESULTS

Six bulk samples were collected from the structures. However, due to multiple layers within some of those samples, a total of nine were analyzed by the laboratory. Table 1A is a listing of homogeneous materials for the project and Table 1B is a listing of analytical results for asbestos.

TABLE 1A
Picnic Pavilion and Associated Brick Bathroom Bldg
Veterans Cemetery Project
ECRH-Gracewood
Gracewood, GA
Homogeneous Areas

HA	Sample Location	Material Description	Category
HA-1	Picnic Pavilion Brick Bathroom Building	Roofing Shingles w/Felt	Misc.
HA-2	Bathroom Building	12"x24" Ceiling Tile	Misc.

LEGEND:
Misc. – Miscellaneous **Surf.** – Surfacing **TSI** – Thermal System Insulation
F – Friable **NF** – Non-friable

TABLE 1B
Picnic Pavilion and Associated Brick Bathroom Bldg
Veterans Cemetery Project
ECRH-Gracewood
Gracewood, GA
Asbestos Analysis Results

Sample ID	# of Samples	HA	Material Description	ACM Present	Type ACM	F/ NF
LE 1A-C	3	1	Roofing Shingles w/Felt	No		NF
LE 2A-C	3	2	12"x24" Ceiling Tile	No		F

6.0 CONCLUSIONS AND RECOMMENDATIONS

Inconclusive results would be results where the Polarized Light Microscopy analysis yielded a result of less than 1% asbestos. These materials would have to be treated as asbestos-containing material or point counted to determine their final status. There were no samples that contained inconclusive results.

During this inspection, materials suspected to contain asbestos may have been identified, but due to their location or current use, were not sampled. These non-sampled suspect materials include, but are not limited to, physically inaccessible materials, and materials that when sampled would degrade the operation of their parent system or contribute to asbestos contamination of a building system. Examples of the last category include gaskets and dampers in ventilation systems, and boiler seals.

In summary, the asbestos survey did not identify any of the materials sampled to contain greater than 1% asbestos. It is ACES' understanding that the building is scheduled for demolition. Although no asbestos was identified in the inspection, the demolition

contractor is required to notify the State of these results and also file proper notification to the State of Georgia EPD.

This inspection was performed by Steve Connor, AHERA Inspector Certificate Number 20700 which is valid until October 17, 2026 and by Mark Franco, AHERA Inspector Certificate Number 25-6TLE1-SHAB (New York) which is valid until June 30, 2026.

ALTERNATIVE CONSTRUCTION & ENVIRONMENTAL SOLUTIONS, INC.

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Augusta, GA 30904

Mailing Address: PO Box 3229, Augusta, GA 30914-3229
Telephone: 706-262-2000 • Facsimile: 706-262-3299 • www.aces-usa.com

March 12, 2026

Client: 2KM Architects, Inc.
529 Greene Street
Augusta, GA 30901
Attn: Ms. Megan Poston, mposton@2kmarchitects.com

Project: Limited Lead Survey of Predominate Colors
Veterans Cemetery Project
Picnic Pavilion and Associated Brick Bathroom Building
East Central Regional Hospital – Gracewood
100 Myrtle Boulevard
Gracewood, GA
Report Number: 619-216-010

1.0 SCOPE

On February 26-27, 2026, a representative of Alternative Construction & Environmental Solutions, Inc. (ACES) conducted a lead-based paint survey at the above referenced property located on the Gracewood Campus of East Central Regional Hospital in Gracewood, Georgia. The purpose of this work was to identify existing lead levels in paint by X-ray Fluorescence (XRF).

2.0 SITE INSPECTION

A site inspection was performed to determine the current condition of the painted surfaces. Surfaces examined were found to be chipping. At the client's request, this survey involved identifying the existence of lead-based paint on interior and exterior painted surfaces.

3.0 SAMPLING AND ANALYSIS

Sampling was accomplished utilizing a Sci Aps Model X550Pb XRF Lead Paint Analyzer with serial number 02471. All paint schemes were identified and readings were taken of each. All results are included in Attachment I as readings 165 through 191.

4.0 ATTACHMENTS

Attachment I XRF Measurements

5.0 CONCLUSION AND RECOMMENDATIONS

- There were no results greater than 1 mg/cm² which constitute lead-based paint according to HUD.

OSHA regulation 29 CFR 1926.62 requires employers to provide adequate protection to their workers that may be exposed to lead dust in excess of the action level of 30 micrograms per cubic meter of air. Where lead is present at any level of concentration, the Federal regulation requires employers to perform assessment exposure monitoring during any demolition/renovation activity that would create lead dust. If no employee is exposed to the action level during this initial assessment, further monitoring can be suspended. Although OSHA does not accept XRF as an absolute negative result, it has been utilized as an immediate indicator for work practices.

OSHA recognizes that Housing and Urban Development (HUD) and the Environmental Protection Agency (EPA) find XRF analyzers acceptable for analyzing lead in paint at their clearance level of 1.0 mg/cm^2. OSHA also recognizes that some instruments can measure accurately at substantially lower levels. However, while XRF analyzers may be an acceptable method of analysis for meeting HUD/EPA requirements, OSHA's concerns are different from those of HUD and EPA. OSHA's mission is to provide a safe and healthful working environment for American workers. To accomplish this task in the area of lead, OSHA relies primarily on airborne measurements to determine employee exposure. OSHA does not consider any method that relies solely on the analysis of bulk materials or surface content of lead (or other toxic material) to be acceptable for safely predicting employee exposure to airborne contaminants.

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ALTERNATIVE CONSTRUCTION & ENVIRONMENTAL SOLUTIONS, INC.

Cliff Hampton
Manager
Industrial Hygiene, Safety & Health Dept.

Steve Connor
Project Manager

Attachment: XRF Readings

DIVISION 1 - GENERAL REQUIREMENTS
SECTION 01 21 00 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS AND WORK

A. All allowances below to be made part of the Base Bid.

1.2 SUMMARY

A. The Contractor shall furnish all labor, materials, tools, equipment and perform all work and services necessary for all work to be performed under Allowances, as specified, in accordance with the provisions of the Contract Documents, and coordinated with work of all other trades. All prices shall include actual cost of labor and materials without General Contractors or Mechanical Subcontractor's overhead and profit which shall be included in the Base Bid.

B. Although such work is not specifically indicated, furnish and install all supplementary and miscellaneous items, appurtenances and devices incidental to for a complete installation.

C. Coordinate pertinent related work and modify surrounding work as required by Contract Documents.

D. All materials and methods of construction used on this project shall conform to the qualifications established by the Contract Documents.

PART 2 - ALLOWANCES

2.1 ALLOWANCES

A. The following Allowances shall be included in the Base Bid. Work shall be performed and approved by the Architect and Owner based on unit prices; time & materials; or lump sum proposals with detailed itemized pricing for the work to be performed. The Allowances are scheduled as follows:

ALLOWANCE NO. 1: Georgia Power – Reroute power to Administration and Maintenance Buildings. See Electrical Site Utilities Plan.

Allowance Amount: $140,000.00

ALLOWANCE NO. 2: Comcast – Remove and redirect cables to service the Administration and Maintenance Building. Install fiber optics communication utility to the Administration Building. Reconnect service to the Board of Regents Facility.

Allowance Amount: $50,000.00

ALLOWANCE NO. 3: City of Augusta Water Connection.

Allowance Amount: $5,000.00

END OF SECTION

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 01 23 00 – ALTERNATES

PART 1 – GENERAL

1.1 RELATED REQUIREMENTS AND WORK

A. Reference the Proposal Form for all work related to this Section for this Project.

1.2 SUMMARY

A. The Contractor shall furnish all labor, materials, tools, equipment and perform all work and services necessary for all Alternates as shown on drawings and as specified, in accordance with the provisions of the Contract Documents and coordinated with work of all other trades. All prices shall include overhead and profit.

B. Although such work is not specifically indicated, furnish and install all supplementary and miscellaneous items, appurtenances and devices incidental to for a complete installation.

C. Coordinate pertinent related work and modify surrounding work as required by Contract Documents.

D. All materials and methods of construction used on this project shall conform to the qualifications established by the Contract Documents.

1.3 QUANTITIES

A. When materials, devices or equipment are referred to as if singular in number, it is intended that such reference shall apply to as many such items as are required to complete the work.

PART 2 – ALTERNATES

2.1 ALTERNATES

A. State in proposal the amount to be added or deducted from the Base Bid for each of the Alternates described below. Upon execution of the Contract, implement work and modify work as established under various Alternates as accepted or rejected by the Owner. Clarifications of Alternates shall be as follows:

ADD ALTERNATE #1: Demolition of Buildings - Picnic Shelter, Restroom Building & Associated Foundations and Site Elements - Pond Fence, Storm Piping, Tables, Debris and Site Clearing around removed structures.

ADD ALTERNATE #2: Road "C" Installation - regular pavement; associated parking stalls, sidewalks, road markings and curb & gutter. Installation of Vase Dispenser Stations and Section Markers along Road "C". Road "D" Installation - heavy duty pavement. Development of Wash Bay #308 and 100’ x 100’ concrete paving area at the Maintenance Building.

ADD ALTERNATE #3: Installation of Carillon Tower. Installation of (1) additional United States Flag and Pole. Installation of (7) Service Flags and Poles at Administration Islands. Installation of Aluminum tri-stained Glass in Committal Shelter. Installation of (3) additional benches.

ADD ALTERNATE #4: Demolition and Abatement of Buildings #99, #100 and #101. Demolition of Building as ACM - Quonset Hut #102.

2.2 UNIT PRICES

A. State in proposal the amount for a Unit Price as described below for material, labor, complete:

UNIT PRICE #1: **U**nsuitable soils – excavate and remove off site and replace per cubic yard.

UNIT PRICE #2: **S**od – material and installation per 100 square feet.

UNIT PRICE #3: Seeding – material and installation per 1 acre.

UNIT PRICE #4: **C**rushed stone base – material and installation per cubic yard.

UNIT PRICE #5: 80-100 sieve stone – material and installation per cubic yard.

PART 3 – EXECUTION (Not Used)

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS
SECTION 01 33 00 – SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

A. The following provisions shall apply:
Contractor shall compile one completed set of approved Shop Drawings and submittals to turn in with the O & M Manuals.

B. Contractor shall submit one (1) electronic copy in PDF form of each shop drawing with:
1. Contractor's Review & Approval stamp, signed & dated;
2. Electronic transmittal form with complete project identification, clearly defined Shop Drawings including references to related Specification or Drawings.
3. Certificate of Build America, Buy America Act (BABAA) Compliance (Manufacturer's Product Certification Letter on Manufacturer's letterhead) with **all** Shop Drawings to show BABAA compliance.
4. Submit to the Architect for review. If corrections are required after the Architect's review, one PDF electronic copy of marked or comments on Shop Drawings will be returned to the Contractor for necessary revisions or corrections. Contractor shall then resubmit one (1) electronic copy in PDF form of corrected drawings for final review, approval, and distribution. However, if for any reasons further corrections are necessary, follow the above procedure until no corrections are required.
5. Confirmation physical "Samples" shall be provided to 2KM with transmittal and related instructions. Submit electronic transmittal for electronic files & tracking review process.
   a. Deliver Samples to 2KM Architects, Inc. Chris Lehi, Senior Contract Administrator.
   529 Greene Street, Augusta, GA 30901.
   b. Field Mock-ups & Sample walls shall be coordinated with Architect & Owner for onsite location.
6. Contractor shall maintain & update Shop Drawing Log reflecting status and email updates 3-days prior to Progress Review Meetings with Owner/Architect/Contractor. (Bi-Weekly or Monthly as scheduled).

C. For standard manufactured items the Contractor shall submit electronic copies of all catalogue sheets, vendors' drawings and certified drawings to the Architect for review. If corrections are required after the Architect's review, an electronic copy of marked up drawings will be returned to the Contractor for revision. Contractor shall then resubmit electronic corrected copies for final review and distribution.

D. Shop drawings submitted for review must bear the stamp of the Contractor stating that they have been checked. It is the Contractor's responsibility to fully check all shop drawings for arrangement and conformance with drawings and specifications, and accuracy of dimensions, including coordination of shop drawings submitted on other work under these specifications. If it appears that such checking has been inadequate, even though stamped as being checked, drawings will be returned to the Contractor for proper checking before further processing by the Architect regardless of any urgency claimed by the Contractor.

E. The review of such drawings by the Architect will be general only. Such review shall not be interpreted as a checking of detailed dimensions or approval of deviations from plans and specifications, unless such a check or deviation is requested at time of submission. Review of drawings shall not relieve the Contractor of his responsibility for accuracy of same, nor for the furnishing of all materials required by the contract, even though same may not be indicated on the reviewed shop drawings.

F. The Contractor must schedule the submission of shop drawings and schedules to allow the Architect **a minimum of ten working days, after receipt**, for the review of each submission. The review of a shop drawing does not authorize changes from the Contract requirements as to materials, workmanship, extent of the work or price unless authorized in a separate Change Order.

G. Submit shop drawings, vendor drawings and certified drawings, to the Architect with a transmittal letter or form addressed to 2KM Architects, Inc., 529 Greene Street, Augusta, GA 30901. Transmittals shall include the sender's name, the project number, name of the Owner, a list of shop drawing numbers and titles and quantity of each print submitted. In addition, Contractor shall mark each drawing with the project number and name of the Owner.

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

1.2 SAMPLES

A. The General Conditions covers samples. The following provisions shall also apply:
1. Name of Project.
2. Location of Project.
3. Name of Contractor.
4. Material or Equipment Represented.
5. Manufacturer's data sheets and drawings, if available.

B. Approval or acceptance of samples will not preclude the rejection of the completed work. After a material has been approved, no change in brand or make will be permitted, unless satisfactory evidence is presented to and approved by the Architect that the manufacturer cannot make delivery of the approved material on schedule. The right is reserved to require submission of samples of any material or any material lists whether or not particularly mentioned herein.

C. **Physical samples are required for all products requiring a color selection.**

1.3 CERTIFICATES

A. Contractor shall obtain certificates of approval, acceptance and compliance from all authorities having jurisdiction over the work and deliver these certificates to the Architect. The work will not be deemed complete nor will final payment be made until such certificates have been delivered.

1.4 RELEASE OF WAIVER OF LIENS

A. Furnish releases and waivers as required by the Contract Documents with final payment application.

1.5 RECORD DRAWINGS

A. Contractor shall maintain one complete set of Drawings at the site, and as the work progresses, the Contractor shall record all changes and actual dimensions of the installed work where deviations are made from the original drawings or specifications relative to work included in this contract.

B. On completion of the job, the Contractor shall deliver one print of such corrected drawings to the Architect. The Contractor shall make such additional corrections as the Architect may require and shall then deliver the corrected prints to the Owner.

C. These Record Drawings are a specific requirement and the Contract will not be considered complete until they have been submitted in an acceptable form.

1.6 WARRANTIES

A. The Contractor shall deliver to the Architect, upon demand and upon completion of all work under this Contract, a written guarantee made out to the Owner, satisfactorily warranting the requirements specified under this section. The Contractor's overall guarantee shall cover a period of one year or longer periods as specified. This guarantee shall be binding upon the Contractor, his successors and assigns.

1.7 DOCUMENTS REQUIRED PRIOR TO FINAL PAYMENT

A. Prior to receipt of Final Payment, the Contractor shall deliver to the Architect the following documents in the quantity indicated: (All copies shall have original signatures and seals.)
1. All Affidavits, Warranties, Certifications, and other documents indicated in the General Conditions, not less than two (2) copies.
2. Operating and Service Manuals on all equipment including Mechanical and Electrical work, including all on-site training, two (2) copies, bound, labeled, and indexed in 3-ring binders, see General Conditions, and Specification Sections.
3. Product Data (tests, labs, etc) for all rated materials (Class A, B, C) installed in the building (paints, fabrics, paper, etc). Also, all contractors will be on site with date for each Fire Marshal inspection (scheduled).
4. Waste Manifests for proper disposal of hazardous waste.
5. Manufacturers material certificates.
6. Contact list of all subcontractors including names, addresses and phone numbers.
7. Comprehensive “Color Section Schedules” as installed.

PART 2 - PRODUCTS

2.1 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 15 days prior to Bid. Requests received after that time may be considered or rejected at discretion of Architect and Owner with monetary credit unless products are unavailable.

B. Conditions: Architect will consider Contractor’s request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements.
1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Work shall not require redesign and evaluation or increased cost.
2. Requested substitution does not require revisions to the contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Substitution request is fully documented and properly submitted for BABAA Compliance.
6. Requested substitution will not adversely affect Contractor’s Construction Schedule.
7. Requested substitution has received necessary approvals of authorities having jurisdiction.
8. Requested substitution provides specified warranty.
9. If requested substitution involves more than one sub-contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS
SECTION 01 40 00 – QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This 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. Specific quality-assurance and control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections and related actions do not limit Contractor's other quality-assurance and control procedures that facilitate compliance with the Contract Documents.
3. 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 include the following:
1. Divisions 1 through 33 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 used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

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

F. 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 industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

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

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

J. 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. Using a term such as “carpentry” does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter.” It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

K. Experienced: When used with an entity, “experienced” means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. General: 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 uncertainties and 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 SUBMITTALS

A. Qualification Data: For testing agencies 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.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that 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 test and inspections.
6. Description of the Work and test and inspection and method.
7. Identification of product and Specification Section.
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 re-inspection.

D. 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.

1.5 QUALITY ASSURANCE

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

B. 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.

C. 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.

D. 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. Manufacturer must be able to provide Contractor with manufactured Product Certification Letter on manufacturer's letterhead to assure BABAA compliance.

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

F. Specialists: Certain sections of the Specifications 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.

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 548; 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. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to 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 timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
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 Document.

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 at least two (2) 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 (7) 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.

1.6 QUALITY CONTROL

A. Contractor Responsibilities: Quality-control services are indicated as Contractor's responsibility; Contractor will engage a qualified testing agency to perform these services.
1. Contractor will furnish Owner with name, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made by Contractor as part of Base Bid.
3. Costs for retesting and reinspection construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be paid directly by Contractor.

B. Tests and inspections not explicitly assigned to Contractor remain Contractor's responsibility. Provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
1. Contractor shall engage a qualified testing agency to perform quality-control services.
2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting required 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 do direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including services connections. Report results in writing as specified in Section 01 33 00 "Submittals".

D. Retesting/Reinspection: Provide quality-control services, including retesting and reinspection, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
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-site 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, or 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.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within thirty (30) days of date established for the Notice to Proceed.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.7 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Contractor will engage a qualified testing agency and special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Contractor 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 inspection at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting test and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Document.
6. Retesting and reinspection corrected work.

B. Conform to special inspection requirements for each trade as required by the Georgia adopted and amended **current** State Building Code, International Building Code.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 ACCEPTABLE TESTING AGENCIES

A. CSRA Testing

B. S&ME

C. Other Qualified Testing Agencies with prior approval.

3.2 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

C. Contractor shall pay for all testing and inspection costs.

3.3 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. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

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.

3.4 FEES AND PERMITS

A. The Contractor shall pay all fees and expenses associated with permits and inspections including authorities and agency expenses.
1. Soil erosion & sitework:
a. Pay for all permits and fees.
1) Sitework permit.
b. Pay all expenses for erosion control monitoring services:
1) Daily inspection and report.
2) Monthly summary report.
3) Distribution of reports to:
a) Architect
b) Owner
c) Contractor
d) State E.P.D. Erosion Control Department

2. Tap Fees:
   a. Pay for all materials, labor, permit, & tap fees for utilities:
      1) Water
      2) Sewer
      3) Fire Water
      4) Meters & Valves
      5) Temporary services.
3. Construction Permits & Fees:
   a. Pay all fees and costs of permits.
   b. Pay all licenses & fees for contractors and sub-contractors for Augusta-Richmond County.

END OF SECTION

STATEMENT OF SPECIAL INSPECTIONS

PROJECT Number and Title: VSB #151-26-01; FAI GA-21-07; GVMC Augusta
2KM Project #25-05.08

LOCATION: 3780 Byrd Road, Augusta, GA 30906

ARCHITECT OF RECORD: 2KM Architects, Inc., Robert L. Mauldin, NCARB, AIA, Principal Architect

STRUCTURAL ENGINEER OF RECORD: Slater Engineering, Brian Slater, P.E. Structural Engineer

MECHANICAL ENGINEER OF RECORD: PFA Engineering, Inc., Martin Ford, P.E. Mechanical Engineer

ELECTRICAL ENGINEER OF RECORD: Electrical Design Consultants, Inc., Audrell Golphin, P.E., Electrical Engineer

CIVIL ENGINEER OF RECORD: Bluewater Engineering Services, Bill Corder, P.E., Civil Engineer

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: 2KM Architects, Inc., Robert L. Mauldin, NCARB, AIA, GA #RA005958

This Statement of Special Inspections is submitted in accordance with Section 1704.3 of the 2024 International Building Code. It includes a *Schedule of Special Inspection Services* applicable to the above-referenced Project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections. If applicable, it includes *Special Inspections for Seismic Resistance* and/or *Special Inspections for Wind Resistance*.

Are *Special Inspections for Seismic Resistance* included in the *Statement of Special Inspections*? ☐ Yes ☒ No

Are *Special Inspections for Wind Resistance* included in the *Statement of Special Inspections*? ☐ Yes ☒ No

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to GSFIC and to the Registered Design Professional in Responsible Charge at a frequency agreed upon by the Design Professional and GSFIC prior to the start of work. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of GSFIC and the Registered Design Professional in Responsible Charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and corrections of any discrepancies noted in the inspections shall be submitted to GSFIC and the Registered Design Professional in Responsible Charge at the conclusion of the project.

Frequency of interim report submittals to GSFIC and the Registered Design Professional in Responsible Charge:

__Weekly __X Bi-Weekly __Monthly Other; specify:_____

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by:

Robert L. Mauldin
Type or print name

Signature 06/09/2026
Date

Preparer's Seal



Special Inspections for Seismic Resistance

See the Schedule of Special Inspections for inspection and testing requirements

Seismic Design Category: C

Special Inspections for Seismic Resistance Required (Yes/No): No

Description of seismic force-resisting system subject to special inspection and testing for seismic resistance:
(Where required per IBC Sections 1705.13.1, 1705.13.2, and 1705.13.3) (Special inspections for seismic resistance of structural steel, where required, shall be in accordance with AISC 341)

N/A

Description of designated seismic systems subject to special inspection and testing for seismic resistance:
(Required for architectural, electrical and mechanical systems and their components that require design in accordance with Chapter 13 of ASCE 7, have a component importance factor, *Ip*, greater than one and are in Seismic Design Categories C, D, E or F.)

N/A

Description of additional seismic systems and components requiring special inspections:
(Required for systems noted in IBC Section 1705.13.5, 1705.13.6, 1705.13.7, and 1705.13.8.)

N/A

Description of additional seismic systems and components requiring testing:
(Where required per IBC Section 1705.14)

N/A

Statement of Responsibility:
Each contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.

N/A

Special Inspections for Wind Resistance

See the Schedule of Special Inspections for inspection and testing requirements

Ultimate Wind Speed, V: 110 **m.p.h.**

Wind Exposure Category: C

Special Inspection for Wind Resistance Required (Yes/No): No
(Required in wind exposure Category B, where the allowable stress design wind speed, V, is 150 miles per hour or greater. Required in wind exposure Category C or D, where the allowable stress design wind speed, V, is 140 miles per hour or greater).)

Description of structural wood and cold-formed steel light frame construction main windforce-resisting system subject to special inspections for wind resistance:
(Required for systems noted in IBC Section 1705.12.1 and 1705.12.2).

N/A

Description of windforce-resisting components subject to special inspections for wind resistance:
(Required for systems and components noted in IBC Section 1705.12.3)

N/A

Statement of Responsibility:
Each contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.

FINAL REPORT OF SPECIAL INSPECTIONS

PROJECT: _____

LOCATION: _____

_____

ARCHITECT OF RECORD: _____

STRUCTURAL ENGINEER OF RECORD: _____

MECHANICAL ENGINEER OF RECORD: _____

ELECTRICAL ENGINEER OF RECORD: _____

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: _____

To the best of my information, knowledge, and belief, which are based upon observations or diligent supervision of our inspection services for the above referenced Project, I hereby state that the special inspections or testing required for this Project, and designated for this Agent in the *Schedule of Special Inspection Services*, have been completed in accordance with the Contract Documents.
The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Interim reports submitted prior to this final report and numbered___to___form a basis for, and are to be considered an integral part of this final report. The following discrepancies that were outstanding since the last interim report dated _____have been corrected:

_____
_____
_____
_____
_____

(Attach 8 ½"x11" continuation sheet(s) if required to complete the description of corrections)

Prepared By:

_____
Special Inspection Agent/Firm

_____
Type or print name

_____
Signature Date

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	**VSB #151-26-01; FAI GA-21-07; GVMC Augusta**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
1705.1.1 Special Cases (work unusual in nature, including but not limited to alternative materials and systems, unusual design applications, materials and systems with special manufacturer's requirements - add additional rows as needed.)	Submittal review, shop (3) and/or field inspection				
1. Inspection of anchors post-installed in solid grouted masonry: Per research reports including verification of anchor type, anchor dimensions, hole dimensions, hole cleaning procedures, anchor spacing, edge distances, masonry unit, grout, masonry compressive strength, anchor embedment and tightening torque	Field inspection	N	Periodic or as required by the research report issued by an approved source		
2. Aggregate Pier Inspection: The special inspector's responsibilities include, but are not limited to, review of the aggregate pier designer's use of soil parameters as presented in the project soils report, and during construction, verification of aggregate properties, type and number of lifts of aggregate, hole size and depths and top elevations of the pier elements, and applied energy. Additionally, results of qualitative tests on production aggregate pier elements such as modulus load testing, uplift pull-out testing, bottom stabilization tests and dynamic cone penetration tests, shall be reviewed to verify compliance with design specifications.	Field inspection	N	Periodic or as required by the research report issued by an approved source		
1705.2.1 Structural Steel Construction					
1. Fabricator and erector documents (Verify reports and certificates as listed in AISC 360, Section N 3.2 for compliance with construction documents)	Submittal Review	Y	Each submittal	E.O.R.	
2. Material verification of structural steel	Shop (3) and field inspection	Y	Periodic	S.I.	
3. Structural steel welding:					
a. Inspection tasks Prior to Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-1)	Shop (3) and field inspection	Y	Observe or Perform as noted (4)	S.I.	
b. Inspection tasks During Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-2)	Shop (3) and field inspection	Y	Observe or Perform as noted (4)	S.I.	
c. Inspection tasks After Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-3)	Shop (3) and field inspection	Y	Observe or Perform as noted (4)	S.I.	
d. Nondestructive testing (NDT) of welded joints:		N			
1) Complete penetration groove welds 5/16" or greater in *risk category* III or IV	Shop (3) or field ultrasonic testing - 100%		Periodic		
2) Complete penetration groove welds 5/16" or greater in *risk category* II	Shop (3) or field ultrasonic testing - 10% of welds minimum		Periodic		
3) Welded joints subject to fatigue when required by AISC 360, Appendix 3, Table A-3.1	Shop (3) or field radiographic or Ultrasonic testing		Periodic		
4) Fabricator's NDT reports when fabricator performs NDT	Verify reports		Each submittal (5)		
4. Structural steel bolting:	Shop (3) and field inspection	N			
a. Inspection tasks Prior to Bolting (Observe, or perform tasks for each bolted connection, in accordance with QA tasks listed in AISC 360, Table N5.6-1)			Observe or Perform as noted (4)		
b. Inspection tasks During Bolting (Observe the QA tasks listed in AISC 360, Table N5.6-2)			Observe (4)		
1) Pre-tensioned and slip-critical joints					
a) Turn-of-nut with matching markings			Periodic		
b) Direct tension indicator			Periodic		
c) Twist-off type tension control bolt			Periodic		
d) Turn-of-nut without matching markings			Continuous		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	**VSB #151-26-01; FAI GA-21-07; GVMC Augusta**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
e) Calibrated wrench			Continuous		
2) Snug-tight joints			Periodic		
c. Inspection tasks After Bolting (Perform tasks for each bolted connection in accordance with QA tasks listed in AISC 360, Table N5.6-3)			Perform (4)		
5. Visual inspection of exposed cut surfaces of galvanized structural steel main members and exposed corners of the rectangular HSS for cracks subsequent to galvanizing	Shop (3) or field inspection	N	Periodic		
6. Embedments (Verify diameter, grade, type, length, embedment. See 1705.3 for anchors)	Field inspection	Y	Periodic	S.I.	
7. Verify member locations, braces, stiffeners, and application of joint details at each connection comply with construction documents	Field inspection	Y	Periodic	S.I.	
1705.2.2 Structural Stainless Steel Construction					
1. Fabricator and erector documents (Verify reports and certificates as listed in AISC 370, Section N 3.2 for compliance with construction documents)	Submittal Review	N	Each submittal		
2. Material verification of structural stainless steel	Shop (3) and field inspection	N	Periodic		
3. Structural stainless steel welding:		N			
a. Inspection tasks Prior to Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 370, Table N5.4-1)	Shop (3) and field inspection		Observe or Perform as noted (4)		
b. Inspection tasks During Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 370, Table N5.4-2)	Shop (3) and field inspection		Observe (4)		
c. Inspection tasks After Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 370, Table N5.4-3)	Shop (3) and field inspection		Observe or Perform as noted (4)		
d. Nondestructive testing (NDT) of welded joints:					
1) Complete penetration groove welds 5/16" or greater in *risk category* III or IV	Shop (3) or field ultrasonic testing - 100%		Periodic		
2) Complete penetration groove welds 5/16" or greater in *risk category* II	Shop (3) or field ultrasonic testing - 10% of welds minimum		Periodic		
3) Welded joints subject to fatigue when required by AISC 370, Appendix 3, Table A-3.1	Shop (3) or field radiographic or Ultrasonic testing		Periodic		
4) Fabricator's NDT reports when fabricator performs NDT	Verify reports		Each submittal (5)		
4. Structural stainless steel bolting:	Shop (3) and field inspection	N			
a. Inspection tasks Prior to Bolting (Observe, or perform tasks for each bolted connection, in accordance with QA tasks listed in AISC 370, Table N5.6-1)			Observe or Perform as noted (4)		
b. Inspection tasks During Bolting (Observe the QA tasks listed in AISC 370, Table N5.6-2)			Observe (4)		
1) Pre-tensioned and slip-critical joints					
a) Turn-of-nut with matching markings			Periodic		
b) Direct tension indicator			Periodic		
c) Twist-off type tension control bolt			Periodic		
d) Turn-of-nut without matching markings			Continuous		
e) Calibrated wrench			Continuous		
2) Snug-tight joints			Periodic		
c. Inspection tasks After Bolting (Perform tasks for each bolted connection in accordance with QA tasks listed in AISC 370, Table N5.6-3)			Perform (4)		
5. Embedments (Verify diameter, grade, type, length, embedment. See 1705.3 for anchors)	Field inspection	N	Periodic		
6. Verify member locations, braces, stiffeners, and application of joint details at each connection comply with construction documents	Field inspection	N	Periodic		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	**VSB #151-26-01; FAI GA-21-07; GVMC Augusta**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
1705.2.3 Cold-Formed Steel Deck					
1. Manufacturer documents (Verify reports and certificates as listed in SDI QA/QC, Section B, Paragraphs B1 and B2 for compliance with construction documents)	Submittal Review	Y	Each submittal	E.O.R.	
2. Material verification of steel deck, mechanical fasteners and welding materials	Shop (3) and field inspection	Y	Periodic	S.I.	
3. Cold-formed steel deck placement:	Shop (3) and field inspection	Y		S.I.	
a. Inspection tasks Prior to Deck Placement (Perform the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.1)		Y	Perform (4)	S.I.	
b. Inspection tasks After Deck Placement (Perform the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.2)		Y	Perform (4)	S.I.	
4. Cold-formed steel deck welding:	Shop (3) and field inspection	N			
a. Inspection tasks Prior to Welding (Observe the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.3)			Observe (4)		
b. Inspection tasks During Welding (Observe the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.4)			Observe (4)		
c. Inspection tasks After Welding (Perform the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.5)			Perform (4)		
5. Cold-formed steel deck mechanical fastening:	Shop (3) and field inspection	Y			
a. Inspection tasks Prior to Mechanical Fastening (Observe the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.6)		Y	Observe (4)	S.I.	
b. Inspection tasks During Mechanical Fastening (Observe the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.7)		Y	Observe (4)	S.I.	
c. Inspection tasks After Mechanical Fastening (Perform the QA tasks listed in SDI QA/QC, Appendix 1 Table 1.8)		Y	Perform (4)	S.I.	
1705.2.4. Open-Web Steel Joists and Joist Girders					
1. Installation of open-web steel joists and joist girders.					
a. End connections - welding or bolted.	per SJI CJ or SJI 100	Y	Periodic	S.I.	
b.. Bridging - horizontal or diagonal.					
1) Standard bridging.	per SJI CJ or SJI 100	Y	Periodic	S.I.	
2) Bridging that differs from the specifications listed in SJI CJ or SJI 100.		Y	Periodic	S.I.	
1705.2.5. Cold-Formed Steel Trusses Spanning 60 feet or Greater					
Verify temporary and permanent restraint/bracing are installed in accordance with the approved truss submittal package	Field inspection	N	Periodic		
1705.2.6. Metal Building Systems					
Inspections as listed above in 1705.2.1, 1705.2.3, 1705.2.4 and 1705.2.5.					
1. Installation of rafter/beam flange braces and column flange braces.	Field inspection	Y	Periodic	S.I.	
2. Installation of purlins and girts, including specified lapping.		Y	Periodic	S.I.	
3. Purlin and girt restraint/bridging/bracing.		Y	Periodic	S.I.	
4. Installation of X-bracing, tightened to remove any sag.		Y	Periodic	S.I.	
1705.3 Concrete Construction					
1. Inspect reinforcement, including prestressing tendons, and verify placement.	Shop (3) and field inspection	Y	Periodic	S.I.	
2. Reinforcing bar welding:		N			
a. Verification of weldability of bars other than ASTM A706.	Shop (3) and field inspection		Periodic		
b. Inspect welding of reinforcement for special moment frames, boundary elements of special structural walls and coupling beams.	Shop (3) and field inspection		Continuous		
c. Inspect welded reinforcement splices.	Shop (3) and field inspection		Continuous		
d. Inspect welding of primary tension reinforcement in corbels.	Shop (3) and field inspection		Continuous		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	**VSB #151-26-01; FAI GA-21-07; GVMC Augusta**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
e. Inspection of single-pass fillet welds 5/16 or less in size.	Shop (3) and field inspection		Periodic		
f. Inspection of all other welds.	Shop (3) and field inspection		Continuous		
3. Inspection of anchors cast in concrete.	Shop (3) and field inspection	Y	Periodic	S.I.	
4. Inspection of anchors post-installed in hardened concrete members per research reports, or, if no specific requirements are provided, requirements shall be provided by the registered design professional and approved by the building official, including verification of anchor type, anchor dimensions, hole dimensions, hole cleaning procedures, anchor spacing, edge distances, concrete minimum thickness, anchor embedment and tightening torque	Field inspection	N	Periodic or as required by the research report issued by an approved source		
a. Adhesive anchors installed in horizontally or upwardly-inclined orientation that resist sustained tension loads.			Continuous		
b. Mechanical and adhesive anchors not defined in 4a.			Periodic		
5. Verify use of approved design mix	Shop (3) and field inspection	Y	Periodic	E.O.R.	
6.a. Prior to placement, fabricate specimens for strength tests, fresh concrete sampling, perform slump or slump flow, and air content density tests, and determine temperature of concrete.	Shop (3) and field inspection	Y	Continuous	S.I.	
6.b. Verify that concrete specimens for strength tests are maintained in the required initial curing and laboratory curing environment, and that the maximum and minimum temperatures during the initial curing period are reported.	Shop (3) and field inspection	Y	Continuous	S.I.	
7. Inspection of concrete and shotcrete placement for proper application techniques	Shop (3) and field inspection	Y	Continuous	S.I.	
8. Verify maintenance of specified curing temperature and techniques	Shop (3) and field inspection	Y	Periodic	S.I.	
9. Inspection of prestressed concrete:	Shop (3) and field inspection	N			
a. Application of prestressing force			Continuous		
b. Grouting of bonded prestressing tendons			Continuous		
10. Inspect erection of precast concrete members	Field inspection	N	Periodic		
11. For precast concrete diaphragm connections or reinforcement at joints classified as moderate or high deformability elements (MDE or HDE) in structures assigned to Seismic Design Category C, D, E, or F, inspect such connections and reinforcement in the field for:	Field inspection				
a. Installation of the embedded parts.		N	Continuous		
b. Completion of the continuity of reinforcement across joints.		N	Continuous		
c. Completion of connections in the field.		N	Continuous		
12. Inspect installation tolerances of precast concrete diaphragm connections for compliance with ACI 550.5.	Field inspection	N	Periodic		
13. Verify in-situ concrete strength, prior to stressing of tendons in post tensioned concrete and prior to removal of shores and forms from beams and structural slabs	Review field testing and laboratory reports	N	Periodic		
14. Inspection of formwork for shape, lines, location and dimensions	Field inspection	N	Periodic		
15. Concrete strength testing and verification of compliance with construction documents	Field testing and review of laboratory reports	Y	Periodic	S.I.	
1705.4 Masonry Construction					
MINIMUM VERIFICATION REQUIREMENTS					
(A) Level 1, 2 and 3 Quality Assurance:					
1. Prior to construction, verification of compliance of submittals	Submittal Review	Y	Prior to Construction	E.O.R.	
(B) Level 2 & 3 Quality Assurance:					

SCHEDULE OF SPECIAL INSPECTIONS SERVICES

PROJECT	VSB #151-26-01; FAI GA-21-07; GVMC Augusta				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT*	DATE COMPLETED
1. Prior to construction verification of f'm and f'_{AAC} except where specifically exempted by the code	Testing by unit strength method or prism test method	N	Prior to Construction		
2. During construction, verification of Slump Flow and Visual Stability Index (VSI) when self-consolidating grout is delivered to project site.	Testing by unit strength method or prism test method	Y	Periodic	S.I.	
(C) Level 3 Quality Assurance:					
1. During construction, verification of f'm and f'_{AAC} for every 5,000 SF	Testing by unit strength method or prism test method	N	Periodic		
2. During construction, verification of proportions of materials as delivered to the project site for premixed or preblended mortar, prestressing grout, and grout other than self-consolidating grout.	Field inspection	N	Periodic		
MINIMUM SPECIAL INSPECTION REQUIREMENTS					
(D) Levels 2 and 3 Quality Assurance:					
1. As masonry construction begins, verify that the following are in compliance:					
a. Proportions of the site-prepared mortar	Field inspection	Y	Periodic	S.I.	
b. Grade and size of prestressing tendons and anchorages	Field Inspection	N	Periodic		
c. Grade, type, and size of reinforcement, anchor bolts, and prestressing tendons and anchorages	Field Inspection	Y	Periodic	S.I.	
d. Prestressing technique	Field Inspection	N	Periodic		
e. Properties of thin-bed mortar for AAC masonry	Field Inspection	N	Level 2 - Continuous[(b)] Level 2 - Periodic[(c)]		
(b) Required for the first 5,000 square feet (c) Required after the first 5,000 square feet		N	Level 3 - Continuous		
f. Sample panel construction	Field Inspection	N	Level 2 - Periodic		
		N	Level 3 - Continuous		
2. Prior to grouting, verify that the following are in compliance:					
a. Grout space	Field Inspection	Y	Level 2 - Periodic	S.I.	
		N	Level 3 - Continuous		
b. Placement of prestressing tendons and anchorages	Field Inspection	N	Periodic		
c. Placement of reinforcement, connectors, and anchor bolts	Field inspection	Y	Level 2 - Periodic	S.I.	
		N	Level 3 - Continuous		
d. Proportions of site-prepared grout and restressing grout for bonded tendons	Field Inspection	Y	Periodic	S.I.	
3. Verify compliance of the following during construction:					
a. Materials and procedures with the approved submittals	Field inspection	Y	Periodic	S.I.	
b. Placement of masonry units and mortar joint construction	Field Inspection	Y	Periodic	S.I.	
c. Size and location of structural members	Field inspection	Y	Periodic	S.I.	
d. Type, size, location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction	Field inspection	Y	Level 2 - Periodic	S.I.	
		N	Level 3 - Continuous		
e. Welding of reinforcement	Field inspection	N	Continuous		
f. Preparation, construction, and protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F)	Field inspection	Y	Periodic	S.I.	
g. Application and measurement of prestressing force	Field testing	N	Continuous		
h. Placement of grout and prestressing grout for bonded tendons is in compliance	Field inspection	N	Continuous		
i. Placement of AAC masonry units and construction of thin-bed mortar joints	Field inspection	N	Level 2 - Continuous[(b)] Level 2 - Periodic[(c)]		
(b) Required for the first 5,000 square feet (c) Required after the first 5,000 square feet		N	Level 3 - Continuous		
4. Observe preparation of grout specimens, mortar specimens, and/or prisms	Field inspection	Y	Level 2 - Periodic	S.I.	
		N	Level 3 - Continuous		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	**VSB #151-26-01; FAI GA-21-07; GVMC Augusta**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
1705.4.1 Glass Unit Masonry and Masonry Veneer in Risk Category IV.					
Inspect and test in accordance with TMS 602 Level 2	Field inspection	N	Periodic		
1705.5 Wood Construction					
1. For prefabricated wood structural elements, inspection of the fabrication process and assemblies in accordance with Section 1704.2.5.	In-plant review (3)	N	Periodic		
2. For high-load diaphragms, verify grade and thickness of structural panel sheathing agree with approved building plans.	Field inspection	N	Periodic		
3. For high-load diaphragms, verify nominal size of framing members at adjoining panel edges, nail or staple diameter and length, number of fastener lines, and that spacing between fasteners in each line and at edge margins agree with approved building plans	Field inspection	N	Periodic		
4. Metal-plate-connected wood trusses:					
a. Verification that permanent individual truss member restraint/bracing has been installed in accordance with the approved truss submittal package when the truss height is greater than or equal to 60".	Field inspection	N	Periodic		
b. For trusses spanning 60 feet or greater: verify temporary and permanent restraint/bracing are installed in accordance with the approved truss submittal package	Field inspection	N	Periodic		
1705.5.3 Mass Timber Construction (Types IV-A, IV-B, and IV-C Construction)					
1. Inspection of anchorage and connection of mass timber construction to timber deep foundation systems.	Field inspection	N	Periodic		
2. Inspect erection of mass timber construction.	Field inspection	N	Periodic		
3. Inspection of connections where installation methods are required to meet design loads.					
a. Threaded Fasteners		N			
1) Verify use of proper installation equipment.	Field inspection	N	Periodic		
2) Verify use of pre-drilled holes where required.	Field inspection	N	Periodic		
3) Inspect screws, including diameter, length, head type, spacing, installation angle, and depth.	Field inspection	N	Periodic		
b. Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads.	Field inspection	N	Continuous		
c. Adhesive anchors not defined in preceding cell.	Field inspection	N	Periodic		
d. Bolted connections.	Field inspection	N	Periodic		
e. Concealed connections	Field inspection	N	Periodic		
1705.6 Soils					
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Field inspection	Y	Periodic	S.I.	
2. Verify excavations are extended to proper depth and have reached proper material.	Field inspection	Y	Periodic	S.I.	
3. Perform classification and testing of compacted fill materials.	Field inspection	Y	Periodic	S.I.	
4. During fill placement, verify use of proper materials and procedures in accordance with the provisions of the approved geotechnical report. Verify densities and lift thicknesses during placement and compaction of compacted fill.	Field inspection	Y	Continuous	S.I.	
5. Prior to placement of controlled fill, inspect subgrade and verify that site has been prepared properly.	Field inspection	Y	Periodic	S.I.	
1705.7 Driven Deep Foundations					
1. Verify element materials, sizes and lengths comply with requirements	Field inspection	N	Continuous		
2. Determine capacities of test elements and conduct additional load tests, as required	Field inspection	N	Continuous		
3. Inspect driving operations and maintain complete and accurate records for each element	Field inspection	N	Continuous		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	**VSB #151-26-01; FAI GA-21-07; GVMC Augusta**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element	Field inspection	N	Continuous		
5. For steel elements, perform additional inspections per Section 1705.2	See Section 1705.2	N	See Section 1705.2		
6. For concrete elements and concrete-filled elements, perform tests and additional inspections per Section 1705.3	See Section 1705.3	N	See Section 1705.3		
7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge	Field inspection	N	In accordance with construction documents		
1705.8 Cast-in-Place Deep Foundations					
1.Inspect drilling operations and maintain complete and accurate records for each element	Field inspection	N	Continuous		
2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end-bearing strata capacity. Record concrete or grout volumes	Field inspection	N	Continuous		
3. For concrete elements, perform tests and additional inspections in accordance with Section 1705.3	See Section 1705.3	N	See Section 1705.3		
1705.9 Helical Pile Foundations					
Verify installation equipment, pile dimensions, tip elevations, final depth, final installation torque and other pertinent installation data as required by construction documents.	Field inspection	N	Continuous		
1705.10 Not Used					
1705.11 Fabricated items					
1. List of fabricated items requiring special inspection during fabrication:	Shop inspection		As noted in each applicable shop activity		
		N			
		N			
2. List of fabricated items to be fabricated on the premises of a fabricator approved to perform such work without special inspection (including name of approved agency providing periodic auditing):					
		N			
		N			
1705.12.1 Structural Wood Special Inspections For Wind Resistance					
1. Inspection of field gluing operations of elements of the main windforce-resisting system	Field inspection	N	Continuous		
2. Inspection of nailing, bolting, anchoring and other fastening of components within the main windforce-resisting system, including wood shear walls, wood diaphragms, drag struts, braces and hold-downs.	Shop (3) and field inspection	N	Periodic		
1705.12.2 Cold-formed Steel Special Inspections For Wind Resistance					
1.Inspection during welding operations of elements of the main windforce-resisting system	Shop (3) and field inspection	N	Periodic		
2. Inspection of screw attachment, bolting, anchoring and other fastening of components within the main windforce-resisting system, including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs.	Shop (3) and field inspection	N	Periodic		
1705.12.3 Wind-resisting Components					
1. Roof covering, roof deck and roof framing connections.	Shop (3) and field inspection	N	Periodic		
2. Exterior wall covering and wall connections to roof and floor diaphragms.	Shop (3) and field inspection	N	Periodic		
1705.13.1 Structural Steel Special Inspections for Seismic Resistance					
1. Seismic force-resisting systems in SDC B, C, D, E, or F.	Shop (3) and field inspection	N	In accordance with AISC 341		
2. Structural steel elements in SDC B, C, D, E, or F other than those in Item 1. including struts, collectors, chords and foundation elements.	Shop (3) and field inspection	N	In accordance with AISC 341		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	**VSB #151-26-01; FAI GA-21-07; GVMC Augusta**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
1705.13.2 Structural Wood Special Inspections for Seismic Resistance					
1. Field gluing operations of elements of the seismic-force resisting system for SDC C, D, E or F.	Field inspection	N	Continuous		
2. Nailing, bolting, anchoring and other fastening of elements of the seismic-force-resisting system including wood shear walls, wood diaphragms, drag struts, braces shear panels and hold-downs for SDC C, D, E or F.	Shop (3) and field inspection	N	Periodic		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	**VSB #151-26-01; FAI GA-21-07; GVMC Augusta**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
1705.13.3 Cold-formed Steel Light-Frame Construction Special Inspections for Seismic Resistance					
1. During welding operations of elements of the seismic-force-resisting system for SDC C, D, E or F.	Shop (3) and field inspection	N	Periodic		
2. Screw attachment, bolting, anchoring and other fastening of components within the seismic-force-resisting system including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs for SDC C, D, E or F.	Shop (3) and field inspection	N	Periodic		
1705.13.4 Designated Seismic Systems Verification Special Inspections for Seismic Resistance					
For SDC C, D, E or F, inspect and verify that that the label, anchorage and mounting conforms to the certificate of compliance in accordance with ASCE 7 Section 13.2.3.	Field inspection	N	Periodic		
1705.13.5 Architectural Components Special Inspections for Seismic Resistance					
1. For SDC D, E or F, inspection during the erection and fastening of exterior cladding and interior or exterior veneer more than 30 feet above grade or walking surface and weighing more than 5 psf.	Field inspection	N	Periodic		
2. For SDC D, E or F, inspection during the erection and fastening of interior nonbearing walls more than 30 feet above grade or walking surface and weighing more than 15 psf.	Field inspection	N	Periodic		
3. For SDC D, E or F, inspection during the erection and fastening of exterior nonbearing walls more than 30 feet above grade or walking surface.	Field inspection	N	Periodic		
4. For SDC D, E or F, inspection during anchorage of access floors	Field inspection	N	Periodic		
1705.13.6 Plumbing, Mechanical and Electrical Components Special Inspections for Seismic Resistance					
1. Inspection during the anchorage of electrical equipment for emergency or standby power systems in SDC C, D, E or F	Field inspection	N	Periodic		
2. Inspection during the anchorage of other electrical equipment in SDC E or F	Field inspection	N	Periodic		
3. Inspection during installation and anchorage of piping systems designed to carry hazardous materials, and their associated mechanical units in SDC C, D, E or F	Field inspection	N	Periodic		
4. Inspection during the installation and anchorage of HVAC ductwork designed to contain hazardous materials in SDC C, D, E or F	Field inspection	N	Periodic		
5. Inspection during the installation and anchorage of vibration isolation systems in SDC C, D, E or F where nominal clearance of 1/4 inch or less is required by the approved construction documents	Field inspection	N	Periodic		
6. Inspection during installation of mechanical and electrical equipment, including duct work, piping systems and their structural supports, where automatic fire sprinkler systems are installed in structures assigned to SDC C, D, E, or F to verify one of the following unless flexible sprinkler hose fittings are used:					
a. ASCE/SEI 7, Section 13.2.4 minimum required clearances have been provided.	Field inspection	N	Periodic		
b. A three inch or greater nominal clearance has been provided between fire protection sprinkler system drops and sprigs and: structural members not used collectively or independently to support the sprinklers; equipment attached to the building structure; and other systems' piping.	Field inspection	N	Periodic		
1705.13.7 Storage Racks Special Inspections for Seismic Resistance					
Inspection during the anchorage of storage racks 8 feet or greater in height in structures assigned to SDC D, E or F.	Field inspection				
1. Materials used, to verify compliance with one or more of the material test reports in accordance with the approved construction documents.	Field inspection	N	Periodic		
2. Fabricated storage rack elements.	Field inspection	N	Periodic		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES					
PROJECT	**VSB #151-26-01; FAI GA-21-07; GVMC Augusta**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
3. Storage rack anchorage installation.	Field inspection	N	Periodic		
4. Completed storage rack system, to indicate compliance with the approved construction documents.	Field inspection	N	Periodic		
1705.13.8 Seismic Isolation Systems					
Inspection during the fabrication and installation of isolator units and energy dissipation devices used as part of the seismic isolation system in structures assigned to SDC B, C, D, E or F.	Shop and field inspection	N	Periodic		
1705.13.9 Cold-formed Steel Special Bolted Moment Frames					
Inspection of installation of cold-formed steel special bolted moment frames in the seismic force-resisting systems in structures assigned to SDC D, E or F.	Field inspection	N	Periodic		
1705.14.1 Structural Steel Testing for Seismic Resistance					
1. Nondestructive testing of structural steel in the seismic force-resisting systems in accordance with AISC 341 in structures assigned to SDC B, C, D, E, or F.	Field test	N	Periodic		
2. Nondestructive testing of structural steel elements in the seismic force-resisting systems not covered in Item 1 above, including struts, collectors, chords, and foundation elements in accordance with AISC 341 in structures assigned to SDC B, C, D, E, or F.	Field test	N	Periodic		
1705.14.2 Seismic Certification of Nonstructural Components					
1.Review certificate of compliance for non-structural components in structures assigned to SDC B, C, D, E, or F.	Certificate of compliance review	N	Each submittal		
1705.14.3 Seismic Certification of Designated Seismic Systems					
Review certificate of compliance for designated seismic system, subject to the requirements of ASCE 7, Section 13.2.4, as noted on the construction documents, in structures assigned to SDC C, D, E or F	Certificate of compliance review	N	Each submittal		
1705.14.4 Seismic Isolation Systems					
Test seismic isolation system in accordance with ASCE 7 Section 17.8 in structures assigned to SDC B, C, D, E or F.	Prototype testing	N	Per ASCE 7		
1705.15 Sprayed Fire-resistive Materials					
Special inspection shall be performed during construction with an additional visual inspection after the rough installation of electrical, sprinklers, mechanical and plumbing systems and suspension systems for ceilings, and before concealment where applicable.		N			
1. Verify surface condition preparation of structural members	Field inspection	N	Periodic		
2. Verify the substrate's minimum ambient temperature before and after application and note the ventilation of the area during and after application as required by the approved manufacturers' written instructions.	Field inspection	N	Periodic		
3. Verify minimum thickness of sprayed fire-resistant materials applied to structural members	Field inspection	N	Periodic		
4. Verify density of the sprayed fire-resistant material complies with approved fire-resistant design	Field inspection and testing	N	Per IBC Section 1705.15.5		
5. Verify the cohesive/adhesive bond strength of the cured sprayed fire-resistant material	Field inspection and testing	N	Per IBC Section 1705.15.6		
6. Condition of finished application	Field inspection	N	Periodic		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES

PROJECT	VSB #151-26-01; FAI GA-21-07; GVMC Augusta				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT*	DATE COMPLETED
1705.16 Intumescent Fire-Resistive Materials					
Special inspection shall be performed during construction with an additional visual inspection after the rough installation of electrical, sprinklers, mechanical and plumbing systems and suspension systems for ceilings, and before concealment where applicable.		N			
Inspect and test intumescent fire-resistive materials applied to structural elements and decks per AWCI 12-B	Field inspection and testing	N	Periodic		
1705.17 Exterior Insulation and Finish Systems (EIFS)					
Inspection of water-resistive barrier over sheathing substrate	Field inspection	N	Periodic		
1705.18 Fire-Resistant Penetrations and Joints					
1. Inspect penetration firestop systems	Field testing	N	Per ASTM E2174		
2. Inspect fire-resistant joint systems	Field testing	N	Per ASTM E2393		
1705.19 Smoke Control Systems					
1. Leakage testing and recording of device locations prior to concealment	Field testing	N	Periodic		
2. Prior to occupancy and after sufficient completion, pressure difference testing, flow measurements, and detection and control verification	Field testing	N	Periodic		
1705.20 Sealing of Mass Timber Construction					
1. Inspect sealants and adhesives to resist passage of air in buildings of Type IV-A, IV-B, and IV-C..	Field testing				
a. At abutting edges and intersections of mass timber building elements required to be fire-resistance rated.	Field testing	N	Periodic		
b. At abutting intersections of mass timber building elements and building elements of other materials where both are required to be fire-resistance rated.	Field testing	N	Periodic		

*** INSPECTION AGENTS**

	FIRM	ADDRESS	TELEPHONE NO.
1.	E.O.R. - Slater Engineering Inc.	PO Box 1010, Augusta GA 30903	706-364-9547
2.	S.I. - To Be Determined		
3.			
4.			

Notes: 1. The inspection and testing agent(s) shall be engaged bythe the Design Professional or GSFIC, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Design Professional and GSFIC prior to commencing work. The qualifications of the Special Inspector(s) and/or testing agencies may be subject to the approval of GSFIC and/or the Design Professional.

2. The list of Special Inspectors may be submitted as a separate document, if noted so above.

3. Shop Inspections of fabricated items are not required where the fabricator is approved in accordance with IBC Section 1704.2.5.1 and listed in activity 1705.11.2.

4. Observe: Observe on a random basis, operations need not be delayed pending these inspections. Perform: These tasks shall be performed for each welded joint, bolted connection, or steel element.

5. NDT of welds completed in an approved fabricator's shop may be performed by that fabricator when approved by GSFIC. Refer to AISC 360, N6.

6. After-The-Fact Inspections: Any area(s) that have been covered without proper inspections shall be immediately brought to the attention of the Design Professional of Record (DPOR) and the Building Official. After-the-fact special inspections, if approved, shall be performed as directed by the DPOR to ensure adequate inspections are performed to meet the design intent.

Are *Special Inspections for Seismic Resistance* included in the *Statement of Special Inspections*? (No)

Are *Special Inspections for Wind Resistance* included in the *Statement of Special Inspections*? (No)

DATE:

Contractor's Statement of Responsibility

Each contractor responsible for the construction or fabrication of a main wind or seismic force-resisting system, designated seismic system or wind or seismic-resisting component listed in the Statement of Special Inspections, Special Inspections for Seismic or Wind Resistance, must submit a Statement of Responsibility.

Project: _____

Contractor's Name: _____

Address: _____

License No.: _____

Description of building systems and components included in Statement of Responsibility:

_____
_____
_____
_____
_____
_____
_____

Contractor's Acknowledgement of Special Requirements

I hereby acknowledge that I have received, read, and understand the Statement of Special Inspections and Special Inspection program:

I hereby acknowledge that control will be exercised to obtain conformance with the approved construction documents.

_____
Name and Title (type or print)

_____ _____
Signature Date

Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2.5.1 of the International Building Code must submit *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project: GVMC Augusta; VSB-151-26-01; FAI No. GA-21-07

Fabricator's Name: _____

Address: _____

Certification or Approval Agency: _____

Certification Number: _____

Date of Last Audit or Approval: _____

Description of structural members and assemblies that have been fabricated:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

_____
Name and Title (type or print)

_____ _____
Signature Date

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

SPECIAL INSPECTION DAILY REPORT

PROJECT NAME / ADDRESS: GVMC Augusta; VSB-151-26-01; FAI No. GA-21-07 3780 Byrd Road, Augusta, GA 30906
INSPECTION TYPE(S) COVERAGE ☐ CONTINUOUS ☐ PERIODIC TIME BEGINNING INSPECTION: TIME ENDING INSPECTION:
DESCRIBE INSPECTIONS MADE, INCLUDING LOCATIONS:
LIST TESTS MADE:
LIST ITEMS REQUIRING CORRECTIONS, CORRECTIONS OF PREVIOUSLY LISTED ITEMS AND PREVIOUSLY LISTED UNCORRECTED ITEMS: PROVIDE COPIES OF DISCREPANCY NOTICES:
COMMENTS:
TO THE BEST OF MY KNOWLEDGE, WORK INSPECTED WAS IN ACCORDANCE WITH THE APPROVED DESIGN DRAWINGS, AND SPECIFICATIONS, EXCEPT AS NOTED ABOVE.

PRINTED FULL NAME	
NOTE BY "SPECIAL INSPECTOR" OR	
SIGNED:	DATE:
CERTIFICATION:	NUMBER:

One copy of this report to remain at job site with the contractor for review upon request.

SPECIAL INSPECTION INTERIM REPORT

PROJECT NAME / ADDRESS:
GVMC Augusta; VSB-151-26-01; FAI No. GA-21-07
3780 Byrd Road, Augusta, GA 30906

INSPECTION TYPE(S) COVERAGE

☐ CONTINUOUS ☐ PERIODIC
TIME BEGINNING INSPECTION: TIME ENDING INSPECTION:

DESCRIBE INSPECTIONS MADE, INCLUDING LOCATIONS:

LIST TESTS MADE:

TOTAL INSPECTION TIME EACH DAY								
	DATE							
	HOURS							

LIST ITEMS REQUIRING CORRECTIONS, CORRECTIONS OF PREVIOUSLY LISTED ITEMS AND PREVIOUSLY LISTED UNCORRECTED ITEMS: PROVIDE COPIES OF DISCREPANCY NOTICES:

COMMENTS:

TO THE BEST OF MY KNOWLEDGE, WORK INSPECTED WAS IN ACCORDANCE WITH THE APPROVED DESIGN DRAWINGS, AND SPECIFICATIONS, EXCEPT AS NOTED ABOVE.

PRINTED FULL NAME	
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY	

SIGNED:	DATE:
CERTIFICATION:	NUMBER:

One copy of this report to remain at job site with the contractor for review upon request.

DISCREPANCY NOTICE No. _____

SPECIAL INSPECTION DISCREPANCY NOTICE

PROJECT NAME / ADDRESS: GVMC Augusta; VSB-151-26-01; FAI No. GA-21-07 3780 Byrd Road, Augusta, GA 30906		
INSPECTION TYPE(S) COVERAGE ☐ CONTINUOUS ☐ PERIODIC		
AREA INSPECTED	TYPE OF INSPECTION	
NOTICE DELIVERED TO: O CONTRACTOR O Design Professional O GSFIC	DATE:	TIME:
MAKE THE FOLLOWING CORRECTIONS AND SECURE INSPECTION APPROVAL PRIOR TO PROCEEDING WITH THIS PHASE OF THE WORK.		
PRINTED FULL NAME		
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY		
SIGNED:	DATE:	
CERTIFICATION:	NUMBER:	

One copy of this report to remain at job site with the contractor for review upon request.

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 41 00 - INDEPENDENT TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. This section describes the requirement to conduct compliance inspections and perform air monitoring activities in conjunction with asbestos abatement.

B. An independent laboratory shall be engaged by the Owner or Representative of the Owner to perform these required testing services. The on-site representative of the independent testing firm shall serve as the Owner's Representative and shall be responsible for compliance inspections, air monitoring and assisting with the enforcement of contract plans and specifications.

C. The on-site representative of the independent testing firm shall maintain daily reports of activities taking place on the job site, problems encountered, decisions reached, unusual conditions, visitors to the job site and general conditions on the job site. These reports shall be given to the Owner upon completion of the project.

D. A complete record of all testing results, certified by the independent testing laboratories, shall be furnished to the Owner upon completion of the project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 AIR MONITORING DURING INTERIOR ASBESTOS ABATEMENT

A. Phased Contrast Microscopy (PCM) analysis of background, daily and pre-final clearance air samples shall be performed on site using NIOSH Method 7400. Verbal results shall be available within 12 hours and written results posted at the job site within 24 hours. Hand-written chain-of-custody forms indicating analysis results shall be acceptable for posting at the job site

B. Air samples shall be collected and analyzed on the following schedule:

1. Five background samples from each established regulated area where friable and/or non-friable materials will be abated prior to any activity that will disturb the materials.

2. Once abatement activities begin, daily air samples shall be collected from the following areas:

    a. Entrance to the clean room of the personnel decontamination facility

    b. Equipment (dirty) room of the personnel decontamination facility

    c. Outside the regulated area in uncontaminated areas of the building

    d. Exhaust of the air circulation and filtration system. If more than one air circulation and filtration machine is used, exhaust of each machine shall be tested during the project.

3. Five final clearance air samples shall be collected from each regulated area that has successfully passed a visual inspection.

4. All areas that have undergone asbestos abatement shall be cleared by Phased Contrast Microscopy (PCM).

C. Should the regulated area not clear final air clearance test due to the Contractor's failure to properly clean the area, subsequent cleaning, inspection and final air clearance testing shall be performed at no additional cost to the Owner.

D. Decontamination of the regulated area is not complete until results of final air clearance samples indicate the standards outlined in SECTION 01 71 40 REGULATED AREA CLEARANCE have been met.

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 41 00 - INDEPENDENT TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. This section describes the requirement to conduct compliance inspections and perform air monitoring activities in conjunction with asbestos abatement.

B. An independent laboratory shall be engaged by the Owner or Representative of the Owner to perform these required testing services. The on-site representative of the independent testing firm shall serve as the Owner's Representative and shall be responsible for compliance inspections, air monitoring and assisting with the enforcement of contract plans and specifications.

C. The on-site representative of the independent testing firm shall maintain daily reports of activities taking place on the job site, problems encountered, decisions reached, unusual conditions, visitors to the job site and general conditions on the job site. These reports shall be given to the Owner upon completion of the project.

D. A complete record of all testing results, certified by the independent testing laboratories, shall be furnished to the Owner upon completion of the project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 AIR MONITORING DURING INTERIOR ASBESTOS ABATEMENT

A. Phased Contrast Microscopy (PCM) analysis of background, daily and pre-final clearance air samples shall be performed on site using NIOSH Method 7400. Verbal results shall be available within 12 hours and written results posted at the job site within 24 hours. Hand-written chain-of-custody forms indicating analysis results shall be acceptable for posting at the job site

B. Air samples shall be collected and analyzed on the following schedule:

1. Five background samples from each established regulated area where friable and/or non-friable materials will be abated prior to any activity that will disturb the materials.

2. Once abatement activities begin, daily air samples shall be collected from the following areas:

    a. Entrance to the clean room of the personnel decontamination facility

    b. Equipment (dirty) room of the personnel decontamination facility

    c. Outside the regulated area in uncontaminated areas of the building

    d. Exhaust of the air circulation and filtration system. If more than one air circulation and filtration machine is used, exhaust of each machine shall be tested during the project.

3. Five final clearance air samples shall be collected from each regulated area that has successfully passed a visual inspection.

4. All areas that have undergone asbestos abatement shall be cleared by Phased Contrast Microscopy (PCM).

C. Should the regulated area not clear final air clearance test due to the Contractor's failure to properly clean the area, subsequent cleaning, inspection and final air clearance testing shall be performed at no additional cost to the Owner.

D. Decontamination of the regulated area is not complete until results of final air clearance samples indicate the standards outlined in SECTION 01 71 40 REGULATED AREA CLEARANCE have been met.

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 41 00 - INDEPENDENT TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. This section describes the requirement to conduct compliance inspections and perform air monitoring activities in conjunction with asbestos abatement.

B. An independent laboratory shall be engaged by the Owner or Representative of the Owner to perform these required testing services. The on-site representative of the independent testing firm shall serve as the Owner's Representative and shall be responsible for compliance inspections, air monitoring and assisting with the enforcement of contract plans and specifications.

C. The on-site representative of the independent testing firm shall maintain daily reports of activities taking place on the job site, problems encountered, decisions reached, unusual conditions, visitors to the job site and general conditions on the job site. These reports shall be given to the Owner upon completion of the project.

D. A complete record of all testing results, certified by the independent testing laboratories, shall be furnished to the Owner upon completion of the project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 AIR MONITORING DURING INTERIOR ASBESTOS ABATEMENT

A. Phased Contrast Microscopy (PCM) analysis of background, daily and pre-final clearance air samples shall be performed on site using NIOSH Method 7400. Verbal results shall be available within 12 hours and written results posted at the job site within 24 hours. Hand-written chain-of-custody forms indicating analysis results shall be acceptable for posting at the job site

B. Air samples shall be collected and analyzed on the following schedule:

1. Five background samples from each established regulated area where friable and/or non-friable materials will be abated prior to any activity that will disturb the materials.

2. Once abatement activities begin, daily air samples shall be collected from the following areas:

    a. Entrance to the clean room of the personnel decontamination facility

    b. Equipment (dirty) room of the personnel decontamination facility

    c. Outside the regulated area in uncontaminated areas of the building

    d. Exhaust of the air circulation and filtration system. If more than one air circulation and filtration machine is used, exhaust of each machine shall be tested during the project.

3. Five final clearance air samples shall be collected from each regulated area that has successfully passed a visual inspection.

4. All areas that have undergone asbestos abatement shall be cleared by Phased Contrast Microscopy (PCM).

C. Should the regulated area not clear final air clearance test due to the Contractor's failure to properly clean the area, subsequent cleaning, inspection and final air clearance testing shall be performed at no additional cost to the Owner.

D. Decontamination of the regulated area is not complete until results of final air clearance samples indicate the standards outlined in SECTION 01 71 40 REGULATED AREA CLEARANCE have been met.

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 41 00 - INDEPENDENT TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. This section describes the requirement to conduct compliance inspections and perform air monitoring activities in conjunction with asbestos abatement.

B. The contractor must obtain a copy of the letter of order issued by a State or local government official that the structure is to be demolished as RACM. Alternately, a professional engineer may make the determination that a facility is unsafe or fraught with unique conditions requiring that it be removed as RACM. Reference 40 CFR 61.141, 61.145(a)(3) and 61.145(c)(4)-(9). This letter can be obtained from the Architect (at no cost to the Contractor) and may be required when filing notification to the State of Georgia for abatement.

C. An independent laboratory shall be engaged by the Owner or Representative of the Owner to perform these required testing services. The on-site representative of the independent testing firm shall serve as the Owner's Representative and shall be responsible for compliance inspections, air monitoring and assisting with the enforcement of contract plans and specifications.

D. The on-site representative of the independent testing firm shall maintain daily reports of activities taking place on the job site, problems encountered, decisions reached, unusual conditions, visitors to the job site and general conditions on the job site. These reports shall be given to the Owner upon completion of the project.

E. A complete record of all testing results, certified by the independent testing laboratories, shall be furnished to the Owner upon completion of the project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 AIR MONITORING DURING EXTERIOR ASBESTOS ABATEMENT

A. Due to the unique nature and condition of the materials associated with this building, a bulk removal of the entire structure as asbestos-containing material is recommended. Phased Contrast Microscopy (PCM) analysis of area air samples shall be performed on site using NIOSH Method 7400. Verbal results shall be available within 12 hours and written results posted at the job site within 24 hours. Hand-written chain-of-custody forms indicating analysis results shall be acceptable for posting at the job site

B. Area air samples shall be collected and analyzed around the perimeter of the regulated area:

1. Once abatement activities begin, a minimum of four daily air samples shall be collected from just outside all sides of the perimeter of the regulated area.

2. These samples must be continuously collected as long as abatement is occurring until the site has successfully passed a final visual inspection.

3. Samples shall be analyzed daily via Phased Contrast Microscopy (PCM) with any adverse changes in fiber counts reported to the Abatement Supervisor so that an adjustment to work practices can be conducted.

C. Should the regulated area not clear final visual clearance test due to the Contractor's failure to properly clean the area, subsequent cleaning, inspection and air sampling shall be performed at no additional cost to the Owner.

D. Removal of the regulated area will not be permitted until final visual certification by the Consultant and Abatement Supervisor has been recorded.

END OF SECTION

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 01 41 13 – CODES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS AND WORK

A. The Division 1 General Requirements, Specifications, Drawings, Addenda and Modifications are binding on all work required for this Project.

1.2 APPLICABLE CODES

A. The following Building Codes are currently adopted by the State of Georgia:

1.	120-3-3		State Minimum Fire Safety Standards	(effective 12/28/2025)
2.	120-3-20	2015	Rules and Regulation of the State of Georgia - Access to and Use of Public Facilities by Handicapped Persons	
3.	ADA	2010	ADA Standards for Accessible Design	
4.	IBC	2024	International Building Code	(w/ GA Amendments 2026)
5.	IFC	2024	International Fire Code	
6.	IPC	2024	International Plumbing Code	(w/ GA Amendments 2026)
7.	IMC	2024	International Mechanical Code	(w/ GA Amendments 2026)
8.	IFGC	2024	International Fuel Gas Code	(w/ GA Amendments 2026)
9.	IECC	2015	International Energy Conservation Code	(w/ GA Amendments 2020, 2022, 2023)
10.	NFPA 10	2022	Standard for Portable Fire Extinguishers	(per 120-3-3)
11.	NFPA 70	2023	National Electrical Code (NEC)	(w/ GA Amendments 2026)
12.	NFPA 72	2022	National Fire Alarm Code	(per 120-3-3)
13.	NFPA 80	2022	Standard for Fire Doors & Other Opening Protectives	(per 120-3-3)
14.	NFPA 90A	2024	Standard for the Installation of Air Conditioning & Ventilating Systems	(per 120-3-3)
15.	NFPA 101	2024	Life Safety Code	(per 120-3-3)
16.	NFPA 241	2022	Standard for Safeguarding Construction, Alteration, & Demolition Operations	(per 120-3-3)
17.	O.C.G.A. 50-8-18		Energy Efficiency and Sustainable Construction Act 2008	

B. Reference to other applicable codes and standards are made in other sections of this specification.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS
SECTION 01 42 13 - ABBREVIATIONS AND ACRONYMS

PART 1 - GENERAL

1.1 REFERENCES

A. Reference to a technical society, institute, association, organization or governmental authority may be made in the Specifications in accordance with the following abbreviations:

AA	Aluminum Association, Inc.
AAMA	American Architectural Manufacturer's Association
AAR	American Association of Railroads
AASHTO	American Association of State Highway and Transportation Officials
AATC	American Association of Textile Chemists and Colorist
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
ACPPA	American Concrete Pressure Pipe Association
ADA	Americans with Disabilities Act
AECI	Association of Edison Illuminating Companies
AGA	American Gas Association, Inc.
AGC	Associated General Contractors of America
AGMA	American Gear Manufacturers Association
AHC	Architectural Hardware Consultants
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANLA	American Nursery & Landscape Association
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
ARI	Air-Conditioning and Refrigeration Institute
ASA	American Standards Association
ASAE	American Society of Agricultural Engineers
ASC	American Standards Code

ASCE	American Society of Civil Engineers
ASLA	American Society of Landscape Architects
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASM	American Society for Metals
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
BABAA	Build America Buy America Act
BHMA	Builders Hardware Manufacturers Association
CBM	Certified Ballast Manufacturers
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CISPI	Cast Iron Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CRSI	Concrete Reinforcing Steel Institute
CSI	Cast Stone Institute
DFPA	Douglas Fir Plywood Association
DOE	U.S. Department of Energy
EPA	Environmental Protection Agency
ETL	Electrical Testing Laboratories
FCC	Federal Communications Commission
FHA	Federal Highway Administration
FIA	Factory Insurance Association
FM	Factory Mutual
FPS	The Forest Products Society
FSC	Forest Stewardship Council

GSA	General Services Administration
HI	Hydraulic Institute
ICC	The International Code Council
IEEE	Institute of Electrical & Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
JIC	Joint Industrial Council
MCA	Manufacturing Chemists Association
MHI	Material Handling Industry of America
MIA	Marble Institute of America
MIC	Masonry Industry Council
MPI	Master Painters Institute
MSS	Manufacturer's Standardization Society of the Valve and Fitting Industry
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NEC	National Electric Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NPCA	National Precast Concrete Association
NSC	National Safety Code
NTMA	The National Terrazzo and Mosaic Association, Inc.
NWMA	The National Woodwork Manufacturers Association, Inc.
OSHA	Occupational Safety and Health Act
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PMA	Pump Manufacturer's Association
RLM	Reflector Luminaire Manufacturers
RTMA	Radio-Television Manufacturer's Association

SAE	Society of Automobile Engineers
SCPI	Structural Clay Products Institute
SDI	Steel Deck Institute
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SSPC	Steel Structures Painting Council
TCA	Tile Council of America
TEMA	Tubular Exchange Manufacturers Association
UL	Underwriter's Laboratories
USDA	U.S. Department of Agriculture
USPS	United States Product Standard

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 01 45 29 – TESTING LABORATORY SERVICES

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained and paid for by Contractor.

1.2 RELATED DOCUMENTS

A. Section 01 40 00 “Quality Requirements”.

1.3 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

B. American Association of State Highway and Transportation Officials (AASHTO):

T27-11(18)	Sieve Analysis of Fine and Coarse Aggregates
T96-02(R2006)	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
T99-10	The Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop
T104-99(R2007)	Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
T180-10	Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop
T191-02(R2006)	Density of Soil In-Place by the Sand-Cone Method

C. American Society for Testing and Materials (ASTM):

A325-13	Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
A370-22	Definitions for Mechanical Testing of Steel Products
A490-14	Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
C31/C31M-22	Making and Curing Concrete Test Specimens in the Field
C33/C33M-18	Concrete Aggregates
C39/C39M-21	Compressive Strength of Cylindrical Concrete Specimens
C109/C109M-21	Compressive Strength of Hydraulic Cement Mortars
C138/C138M-17a	Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
C143/C143M-20 S	lump of Hydraulic Cement Concrete
C172/C172M-17	Sampling Freshly Mixed Concrete
C173/C173M-16	Air Content of freshly Mixed Concrete by the Volumetric Method
C330/C33OM-09	Lightweight Aggregates for Structural Concrete
C567/C567M-19	Density Structural Lightweight Concrete
C1064/C1064M-17	Freshly Mixed Hydraulic Cement Concrete
C1077-17	Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
D1188-15	Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
D1556-15E01	Density and Unit Weight of Soil in Place by the Sand-Cone Method
D1557-12R21	Laboratory Compaction Characteristics of Soil Using Modified Effort
D2166M-16	Unconfined Compressive Strength of Cohesive Soil
D2167-15	Density and Unit Weight of Soil in Place by the Rubber Balloon Method
D2216-19	Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
D2974-20E01	Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

D3666-16	Minimum Requirements for Agencies Testing and Inspection Bituminous Paving Materials
D3740-19	Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock
E94M-22	Radiographic Examination
E164-19	Contact Ultrasonic Testing of Weldments
E329-21	Agencies Engaged in Construction Inspection, Testing, or Special Inspection
E543-21	Agencies Performing Nondestructive Testing

D. American Welding Society (AWS):

D1.1-07	Structural Welding Code-Steel

1.4 REQUIREMENTS

A. Accreditation Requirements: Testing Laboratory retained and paid for by Contractor must be accredited by one or more of the National Voluntary Laboratory Accreditation Program (NVLAP) programs acceptable in the geographic region for the project. Furnish to the Architect/Engineer a copy of the Certificate of Accreditation and Scope of Accreditation. For testing laboratories that have not yet obtained accreditation by a NVLAP program, submit an acknowledgement letter from one of the laboratory accreditation authorities indicating that the application for accreditation has been received and the accreditation process has started, and submit to the Architect/Emgimeer for approval, certified statements, signed by an official of the testing laboratory attesting that the proposed laboratory, meets or conforms to the ASTM standards listed below as appropriate to the testing field.

1. Laboratories engaged in testing of construction materials must meet the requirements of ASTM E329.
2. Laboratories engaged in testing of concrete and concrete aggregates must meet the requirements of ASTM C1077.
3. Laboratories engaged in testing of bituminous paving materials must meet the requirements of ASTM D3666.
4. Laboratories engaged in testing of soil and rock, as used in engineering design and construction, must meet the requirements of ASTM D3740.
5. Laboratories engaged in inspection and testing of steel, stainless steel, and related alloys will be evaluated according to ASTM A880.
6. Laboratories engaged in non-destructive testing (NDT) must meet the requirements of ASTM E543.
7. Laboratories engaged in Hazardous Materials Testing must meet the requirements of OSHA and EPA.

B. Inspection and Testing: Testing laboratory to inspect materials and workmanship and perform tests described herein and additional tests requested by A/E. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory must direct attention of A/E to such failure.

C. Written Reports: Testing laboratory to submit test reports to A/E and Contractor within 24 hours after each test is completed unless other arrangements are agreed to in writing by the A/E. Submit reports of tests that fail to meet construction contract requirements on colored paper.

D. Verbal Reports: Give verbal notification to A/E immediately of any irregularity.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 EARTHWORK

A. General: The Testing Laboratory is to provide qualified personnel, materials, equipment, and transportation as required to perform the services identified/required herein, within the agreed to

schedule and/or time frame. The work to be performed is as identified herein including, but not be limited to, the following:

1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the A/E regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to A/E extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.
2. Provide part time observation of fill placement and compaction and field density testing in pavement areas to verify that earthwork compaction obtained is in accordance with contract documents.
3. Provide supervised geotechnical technician to inspect excavation, subsurface preparation, and backfill for structural fill.

B. Testing Compaction:

1. Should the testing laboratory propose these alternative methods, they must provide satisfactory explanation to the A/E before the tests are conducted.
    a. Pavement Subgrade: One test for each 335 m^2 (400 square yards), but in no case fewer than two tests.
    b. Curb, Gutter, and Sidewalk: One test for each 90 m (300 feet), but in no case fewer than two tests.
    c. Trenches: One test at maximum 30 m (100 foot) intervals per 1200 mm (4 foot) of vertical lift and at changes in required density, but in no case fewer than two tests.
    d. Footing Subgrade: At least one test for each layer of soil on which footings will be placed. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested subgrade when acceptable to A/E. Verify subgrade is level, all loose or disturbed soils have been removed, and correlate actual soil conditions observed with those indicated by test borings.

C. Testing for Footing Bearing Capacity: Evaluate if suitable bearing capacity material is encountered in footing subgrade.

D. Testing Materials: Test suitability of on-site and off-site borrow as directed by A/E.

3.2 FOUNDATION PILES

A. Witness load test procedure for conformance with ASTM D1143 and interpret test data to verify geotechnical recommendations for pile capacity. Submit load test report in accordance with ASTM D1143.

B. Review Contractor's equipment, methods, and procedures prior to starting any work on site. Provide continuous inspection of pile installation. Maintain a record of all pertinent phases of operation for submittal to A/E.

3.3 LANDSCAPING

A. Test topsoil for organic materials, pH, phosphate, potash content, and gradation of particles.

1. Test for organic material by using ASTM D2974.
2. Determine percent of silt, sand, clay, and foreign materials such as rock, roots, and vegetation.
3. Test for moisture absorption capacity.

B. Submit laboratory test report of topsoil to A/E.

3.4 ASPHALT CONCRETE PAVING

A. Aggregate Base Course:

1. Sample and test aggregate as necessary to insure compliance with specification requirements for gradation, wear, and soundness as specified in the applicable state highway standards and specifications.

B. Asphalt Concrete:
1. Aggregate: Sample and test aggregates in stockpile and hot-bins as necessary to insure compliance with specification requirements for gradation (AASHTO T27), wear (AASHTO T96), and soundness (AASHTO T104).
2. Temperature: Check temperature of each load of asphalt concrete at mixing plant and at site of paving operation.
3. Density: Make a minimum of two field density tests in accordance with ASTM D1188 of asphalt base and surface course for each day's paving operation.

3.5 SITE WORK CONCRETE

A. Test site work concrete including materials for concrete as required in Article CONCRETE of this section.

3.6 CONCRETE

A. Batch Plant Inspection and Materials Testing:
1. Perform continuous batch plant inspection until concrete quality is established to satisfaction of A/E with concurrence of Contracting Officer and perform periodic inspections thereafter as determined by A/E.
2. Periodically inspect and test batch proportioning equipment for accuracy and report deficiencies to A/E.
3. Sample and test mix ingredients as necessary to insure compliance with specifications.
4. Sample and test aggregates daily and as necessary for moisture content. Test the dry rodded weight of the coarse aggregate whenever a sieve analysis is made, and when it appears there has been a change in the aggregate.
5. Certify, in duplicate, ingredients and proportions and amounts of ingredients in concrete conform to approved trial mixes. When concrete is batched or mixed off immediate building site, certify (by signing, initialing or stamping thereon) on delivery slips (duplicate) that ingredients in truck-load mixes conform to proportions of aggregate weight, cement factor, and water-cement ratio of approved trial mixes.

B. Field Inspection and Materials Testing:
1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the Specification requirements. Rejected loads are to be removed from the site at the Contractor’s expense. Any rejected concrete that is placed will be subject to removal.
3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least three cylinders for each 40 m^3 (50 cubic yards) or less of each concrete type, and at least three cylinders for any one day's pour for each concrete type. // After good concrete quality control has been established and maintained as determined by A/E make three cylinders for each 80 m^3 (100 cubic yards) or less of each concrete type, and at least three cylinders from any one day's pour for each concrete type. Label each cylinder with an identification number. A/E may require additional cylinders to be molded and cured under job conditions.
4. Perform slump tests in accordance with ASTM C143. Test the first truck each day, and every time test cylinders are made. Test pumped concrete at the hopper and at the discharge end of the hose at the beginning of each day’s pumping operations to determine change in slump.
5. Determine the air content of concrete per ASTM C173. For concrete required to be air-entrained, test the first truck and every 20 m^3 (25 cubic yards) thereafter each day. For concrete not required to be air-entrained, test every 80 m^3 (100 cubic yards) at random.

For pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.

6. If slump or air content fall outside specified limits, make another test immediately from another portion of same batch.
7. Perform unit weight tests in compliance with ASTM C138 for normal weight concrete and ASTM C567 for lightweight concrete. Test the first truck and each time cylinders are made.
8. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
9. Verify that specified mixing has been accomplished.
10. Environmental Conditions: Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations:
    a. When ambient air temperature falls below 4.4 degrees C (40 degrees F), record maximum and minimum air temperatures in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.
    b. When ambient air temperature rises above 29.4 degrees C (85 degrees F), record maximum and minimum air temperature in each 24-hour period; record minimum relative humidity; record maximum wind velocity; record maximum temperature of surface of hardened concrete.
11. Inspect the reinforcing steel placement, including bar size, bar spacing, top and bottom concrete cover, proper tie into the chairs, and grade of steel prior to concrete placement. Submit detailed report of observations.
12. Observe conveying, placement, and consolidation of concrete for conformance to specifications.
13. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.
14. Observe curing procedures for conformance with specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
15. Observe preparations for placement of concrete:
    a. Inspect handling, conveying, and placing equipment, inspect vibrating and compaction equipment.
    b. Inspect preparation of construction, expansion, and isolation joints.
16. Observe preparations for protection from hot weather, cold weather, sun, and rain, and preparations for curing.
17. Observe concrete mixing:
    a. Monitor and record amount of water added at project site.
    b. Observe minimum and maximum mixing times.
18. Measure concrete flatwork for levelness and flatness as follows:
    a. Perform Floor Tolerance Measurements F_F and F_L in accordance with ASTM E1155. Calculate the actual overall F- numbers using the inferior/superior area method.
    b. Perform all floor tolerance measurements within 48 hours after slab installation and prior to removal of shoring and formwork.
    c. Provide the Contractor and the A/E with the results of all profile tests, including a running tabulation of the overall F_F and F_L values for all slabs installed to date, within 72 hours after each slab installation.
19. Other inspections:
    a. Grouting under base plates.
    b. Grouting anchor bolts and reinforcing steel in hardened concrete.

C. Laboratory Tests of Field Samples:

1. Test compression test cylinders for strength in accordance with ASTM C39. For each test series, test one cylinder at 7 days and one cylinder at 28 days. Use remaining cylinder as a spare tested as directed by A/E. Compile laboratory test reports as follows: Compressive strength test to be the result of one cylinder, except when one cylinder shows evidence of improper sampling, molding or testing, in which case it must be discarded and strength of spare cylinder to be used.
2. Make weight tests of hardened lightweight structural concrete in accordance with ASTM C567.

3. Furnish certified compression test reports to A/E. In test report, indicate the following information:
   a. Cylinder identification number and date cast.
   b. Specific location at which test samples were taken.
   c. Type of concrete, slump, and percent air.
   d. Compressive strength of concrete in MPa (psi).
   e. Weather conditions during placing.
   f. Temperature of concrete in each test cylinder when test cylinder was molded.
   g. Maximum and minimum ambient temperature during placing.
   h. Ambient temperature when concrete sample in test cylinder was taken.
   i. Date delivered to laboratory and date tested.

3.7 REINFORCEMENT

A. Review mill test reports furnished by Contractor.

B. Make one tensile and one bend test in accordance with ASTM A370 from each pair of samples obtained.

C. Written report must include, in addition to test results, heat number, manufacturer, type and grade of steel, and bar size.

D. Perform tension tests of mechanical and welded splices in accordance with ASTM A370.

END OF SECTION

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, toilets, water, and security and protection facilities.

1.2 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction team, Architect, Testing Agencies, and Authorities having jurisdiction.

B. Sewer, Water, and Electric Power Service: Contractor shall establish and pay all expenses for temporary utilities. Power and water exist on site. Temporary extension & costs are Contractors expense. Sewer must be self-contained, pumped & removed from site.

C. Electric Power Service: Provide connections and extensions of services as required for construction operations. Pay all costs.

1.3 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, access routes and parking areas for construction personnel.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install temporary service to comply with NFPA 70 & Georgia Power Standards.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Treat, test and sanitize all water piping prior to connection to water utility. (Augusta-Richmond County water system.)

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall 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- (3.76-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, with galvanized barbed-wire top strand.

B. Portable temporary Chain-Link Fencing: Minimum 2-inch (50-mm), 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide concrete bases for supporting posts.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading. Install seismic & wind tie-down anchors. Install stairs, landings & code compliant access.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
   1. Store combustible materials apart from buildings.

C. Construct site project sign & remove upon completion.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
   1. Provide in all vehicles & equipment.
   2. Provide in Field office/trailer.

2.4 GROUND BREAKING CEREMONY EQUIPMENT

A. Project sign as determined by Architect.
   1. Manufacture project sign and erect prior for ground breaking ceremony (unless approved otherwise by Owner). See detail.
   2. Locate as directed by Owner and Architect, readily visible to the public.

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.

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. Restore site to prior condition or new condition of permanent work.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully & self-contained.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction and permanent water system.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone service to field office. (Reliable wireless is acceptable)
   1. At each telephone, post a list of important telephone numbers.
      a. Police and fire departments.
      b. Ambulance service.
      c. Contractor's home office.
      d. Architect's office.
      e. Engineers' offices.

f. Owner's office & Facility.
g. Principal subcontractors' field and home offices.
h. Testing Agencies.
i. Local and State Agencies.

2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines. Comply with NFPA 241.
2. Maintain support facilities until Completion. Remove before Architect's Final Certificate. Personnel remaining after Architect's Final Certificate will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads: Construct and maintain temporary roads adequate for construction operations. Locate temporary roads and paved areas in same location as permanent roads and paved areas. 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 according to Project & specification.
3. Recondition base after temporary use, including removing unsuitable material, regarding proof-rolling, & compacting.
4. Delay installation of final course of permanent hot-mix asphalt pavement until grading is complete (minor landscape and finish grading remaining). Repair hot-mix asphalt base-course pavement before installation of final course according to Specification Section "Hot-Mix Asphalt Paving."

C. Dewatering Facilities and Drains: Comply with requirements of Georgia Department of Natural Resources, Richmond County. 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.

D. Project Identification and Temporary Signs: Provide Project identification and other signs as indicated on Drawings. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
1. Provide temporary, directional signs for construction personnel and visitors.
2. Maintain and touchup signs so they are legible at all times.
3. Provide project sign, 4' x 8' with 2 sides each with 6' x 6' posts, and bolted 6' x 6' frame, see detail.

E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Section 01 70 00 "Execution and Closeout Requirements" for progress cleaning requirements. Pay all costs for box rental and disposal fees.

F. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that 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 adjacent properties and walkways, according to requirements of authorities having jurisdiction.
   1. Inspect, repair, and maintain erosion and sedimentation control measures daily during construction until permanent vegetation has been established.

C. Stormwater Control: Comply with NPDES and GA EPD/DNR. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Comply with requirements specified in Section "Tree Protection and Trimming."

E. Barricades, Warning Signs, and Lights: Comply with requirements of State Fire Marshal, OSHA, current IBC & NFPA 241 for erecting structurally adequate barricades, including warning signs and lighting.

F. 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 State Fire Marshal, OSHA, GA Building Codes.
   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.

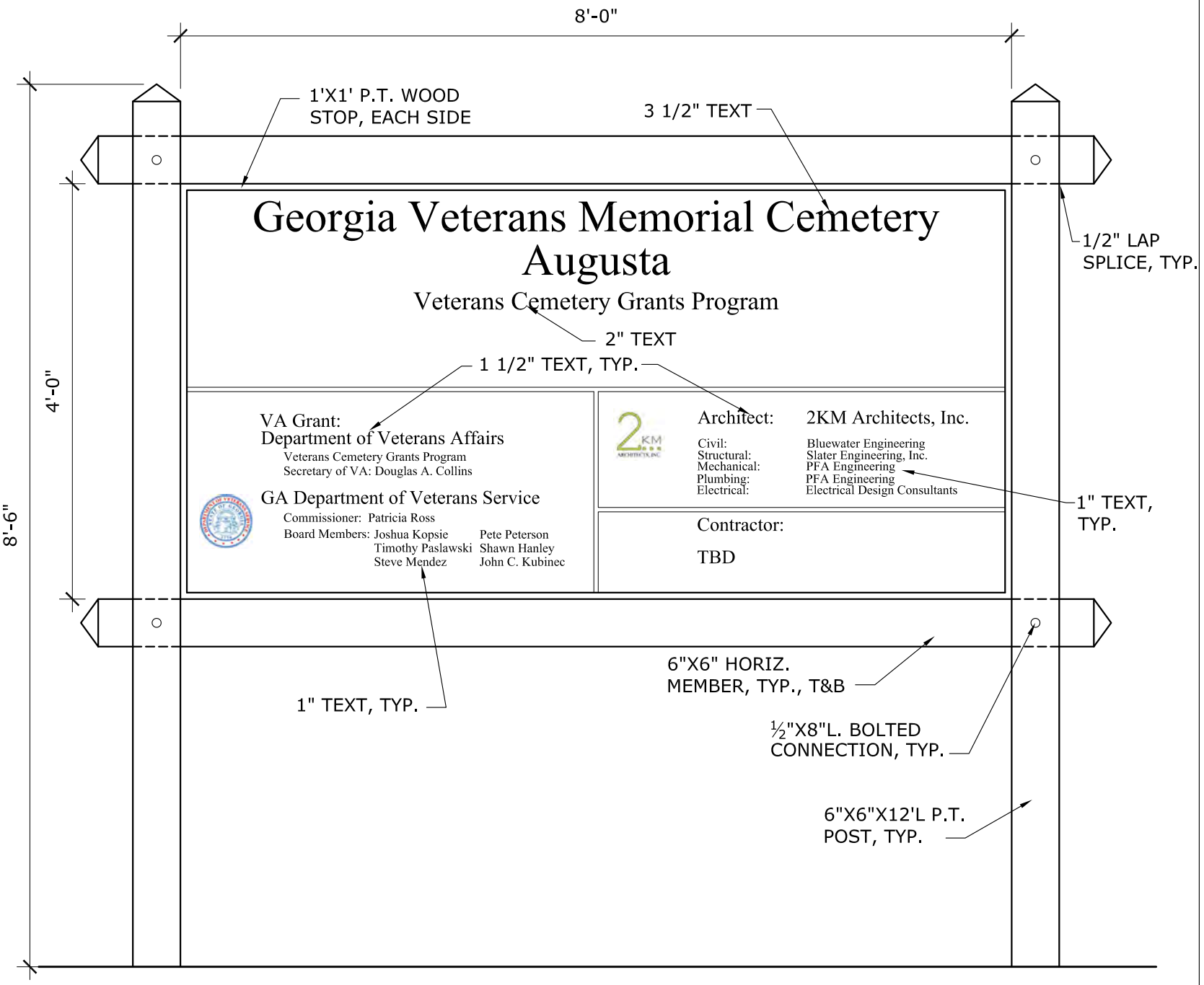
3.5 OPERATION, TERMINATION, AND REMOVAL

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.
   2. Contractor shall bear costs of water and electrical power use exceeding nominal historic use, (Power/Water bill) plus 10%.

C. 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 Final 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 Architect’s Final Certificate, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."
   3. Provide full term warranty from date of “Architect’s Final Certificate” of all permanent systems used for “Temporary Facilities”:
      a. Site utilities and systems.

END OF SECTION



JOBSITE SIGN

SCALE: 3/4"=1'-0"

NOTE:
ALL VA AND GEORGIA DVS POSITIONS SHOULD BE VERIFIED AND CONFIRMED PRIOR TO FABRICATION OF SIGNAGE

2KM ARCHITECTS, INC.
529 GREENE ST. AUGUSTA, GA. 30901
(706) 736 3333 - FAX (706) 736 7100

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REVISION

#	DATE	DESCRIPTION

GEORGIA VETERANS MEMORIAL CEMETERY - AUGUSTA

FOR

DEPARTMENT OF VETERANS SERVICE

VSB **151-26-01** FAI **GA-21-07**

3780 BYRD ROAD, AUGUSTA, GA 30906

DRAWING TITLE

01 50 00 JOBSITE SIGN

PROJECT NO.	25-05.08
DATE	06/23/2026
DRAWN BY	JA
PAPER	8.5"x11"
ISSUE	100% BID SET

DRAWING NO.

SIGN #1

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 56 30 - DECONTAMINATION UNITS FOR ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 GENERAL

A. Provide separate Personnel and Equipment Decontamination facilities during asbestos abatement. Require that the Personnel Decontamination Unit be the only means for workers and visitors to ingress and egress the Regulated Area.

B. Require that all materials and equipment exit the Regulated Area through the Equipment Decontamination Unit.

PART 2 - PRODUCTS

2.01 POLYETHYLENE PLASTIC SHEETING

A. Provide polyethylene plastic sheeting in the largest sheet size possible to minimize seams: 4-mil and 6-mil thickness, clear, frosted, and/or black as required.

B. Polyethylene plastic sheeting shall be flame resistant and conform to the National Fire Protection Association Standard 701, "Small-Scale Fire Test for Flame-Resistant Textiles and Films".

2.02 ADHESIVES

A. Duct tape shall be a minimum of 1.5 inches wide with an adhesive formulated to stick aggressively to polyethylene plastic sheeting.

B. Spray adhesives shall be formulated to stick aggressively to polyethylene plastic sheeting.

PART 3 - EXECUTION

3.01 PERSONNEL DECONTAMINATION UNIT

A. Provide a personnel decontamination unit consisting of a serial arrangement of connected rooms or spaces (clean [change] room, shower room, equipment [dirty] room) separated from each other and from the regulated area by airlocks. A schematic diagram of a typical decontamination unit is illustrated in an attachment to this section. Require all persons without exception to pass through this decontamination unit for entry into and exiting from the regulated area for any purpose. Do not allow parallel routes for entry or exit. Do not remove equipment or materials through the personnel decontamination unit. Provide temporary lighting within decontamination units as necessary to reach a lighting level of 100-foot candles.

B. Provide a clean room the purpose of changing into protective clothing.

C. Provide an airlock between the shower room and clean room. This is a transit area for workers. An airlock is a system for permitting entrance and exit with minimum air movement between a contaminated area and an uncontaminated area, typically consisting of two curtained doorways separated by a distance of at least three (3) feet.

D. Provide a watertight operational shower to be used for transit by cleanly dressed workers heading for the regulated area from the clean room, or for showering by workers headed out of the regulated area after undressing in the equipment room. Contaminated water from the shower room shall be either drummed or filtered with a 5-micron filter before being discharged to a sanitary sewer No water shall be allowed to leak or drain outside of the regulated area or the shower room.

E. Provide an airlock between shower room and equipment room. This is a transit area for workers.

F. Construct an equipment room and require work equipment, footwear, and additional contaminated work clothing to be left here. This is a change and transit area for workers.

G. Separate the regulated area from the equipment room by polyethylene barriers. If the airborne asbestos level in the regulated area is expected to be high, add an intermediate cleaning space between the equipment room and the regulated area. Damp wipe-clean all surfaces of the equipment room after each shift change. Provide one additional drop cloth of 6-mil polyethylene on the floor of the equipment room per shift change and remove contaminated layer after each shift.

3.02 DECONTAMINATION SEQUENCE

A. Require that all workers adhere to the following sequence when entering or leaving the regulated area.

1. Worker enters clean room and removes street clothing, puts on clean disposable coveralls and respirator, and passes through the airlock to the shower room, through a second airlock and into the equipment room.

2. Any additional clothing and equipment left in the equipment room needed by the worker are retrieved at this time.

3. Worker proceeds to regulated area.

4. Before leaving the regulated area, require the worker remove all gross contamination and debris from coveralls and feet.

5. The worker then proceeds to the equipment room and removes all clothing except respiratory protection equipment.

6. Extra work clothing such as boots, hard hats, goggles, and gloves are to be stored in contaminated end of the equipment room.

7. Disposable coveralls are placed in a bag for disposal with other waste material.

8. After showering and shampooing, the worker moves to the clean room and dresses in either new coveralls for another entry to the regulated area, or street clothes if leaving the work site.

3.03 EQUIPMENT DECONTAMINATION UNIT

A. Provide an equipment decontamination unit consisting of a serial arrangement of rooms (holding room, washroom, ramp) for removal of equipment and material from the regulated area. Do not allow personnel to enter or exit the regulated area through the equipment decontamination unit.

B. A schematic diagram of a typical equipment decontamination unit is illustrated in an attachment to this Section.

C. Provide an enclosed washroom located adjacent to the regulated area for cleaning of bagged or containerized asbestos-containing waste materials.

D. Provide a holding area separated from the adjacent rooms by flap doors fabricated from 6-mil polyethylene plastic sheeting.

E. Provide a load out area from the equipment decontamination unit to an enclosed truck or other suitable waste container.

3.04 LOAD OUT AREA

A. The load out area is the transfer area from the building to a truck or dumpster. It may be a ramp leading from the equipment decontamination unit, a separate room, or a loading dock area.

B. During transfer of material from the load out area, erect primary barriers as necessary to seal path from load out area to truck or dumpster.

3.05 SIGNS

A. Post an approximately 20 inch by 14-inch manufactured caution sign at each entrance to the regulated area displaying the following legend as required by 29 CFR 1926.1101. Provide signs as follow:

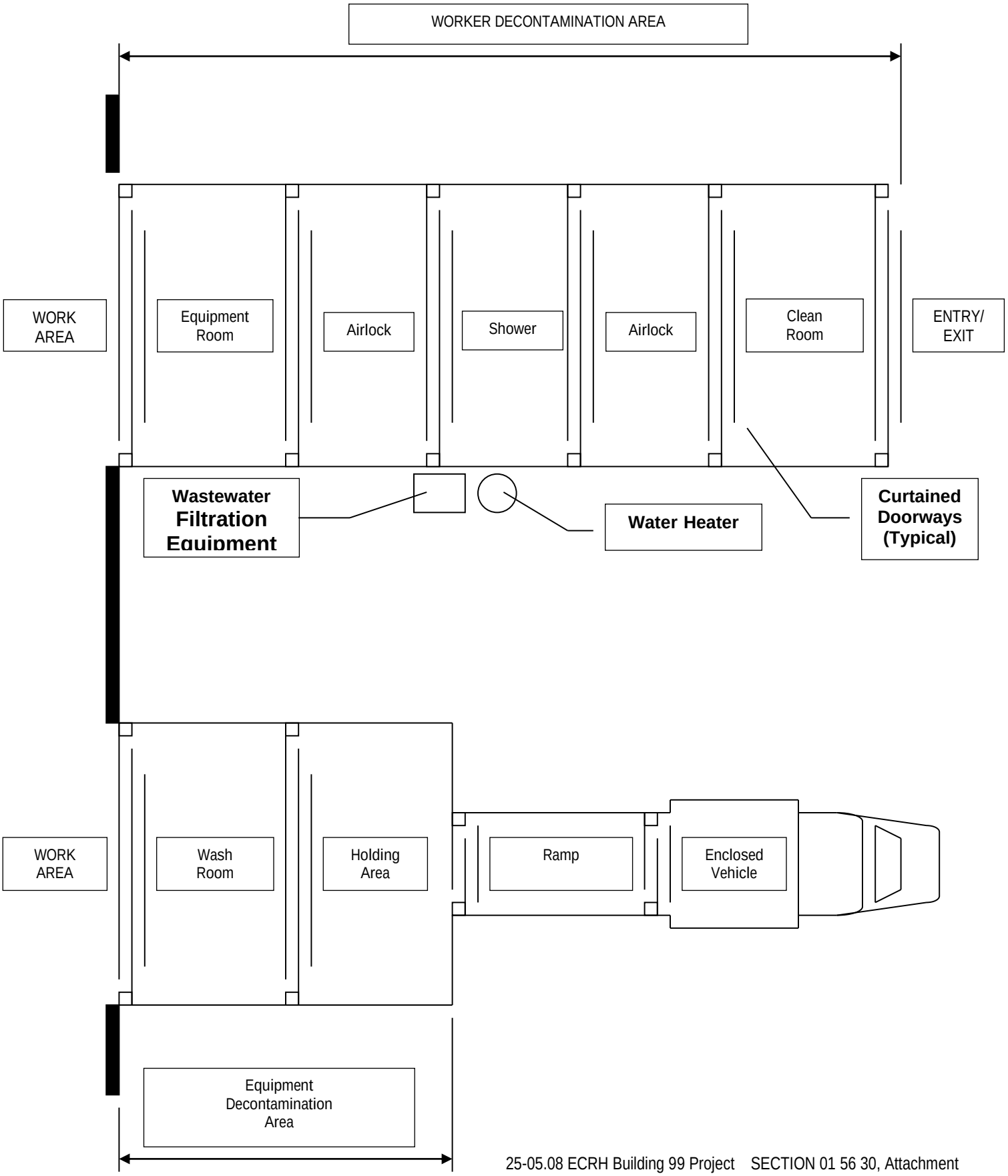
DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA
AUTHORIZED PERSONNEL ONLY

B. Post an approximately 10 inch by 14-inch manufactured sign at each entrance to each regulated area displaying the following legend with letter sizes and styles of a visibility at least equal to the following:

Legend	Notation
NO FOOD, BEVERAGES OR TOBACCO PERMITTED	3/4" Block
ALL PERSONS SHALL DON PROTECTIVE CLOTHING (COVERINGS) BEFORE ENTERING THE REGULATED AREA	3/4" Block
ALL PERSONS SHALL SHOWER IMMEDIATELY AFTER LEAVING REGULATED AREA AND BEFORE ENTERING THE CHANGING AREA	3/4" Block

END OF SECTION

SKETCH OF TYPICAL
PERSONNEL AND EQUIPMENT
DECONTAMINATION UNITS
FOR ASBESTOS ABATEMENT



DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 56 30 - DECONTAMINATION UNITS FOR ASBESTOS ABATEMENT

PART 1 - GENERAL

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PART 2 - PRODUCTS

2.01 POLYETHYLENE PLASTIC SHEETING

A. Provide polyethylene plastic sheeting in the largest sheet size possible to minimize seams: 4-mil and 6-mil thickness, clear, frosted, and/or black as required.

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2.02 ADHESIVES

A. Duct tape shall be a minimum of 1.5 inches wide with an adhesive formulated to stick aggressively to polyethylene plastic sheeting.

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PART 3 - EXECUTION

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G. Separate the regulated area from the equipment room by polyethylene barriers. If the airborne asbestos level in the regulated area is expected to be high, add an intermediate cleaning space between the equipment room and the regulated area. Damp wipe-clean all surfaces of the equipment room after each shift change. Provide one additional drop cloth of 6-mil polyethylene on the floor of the equipment room per shift change and remove contaminated layer after each shift.

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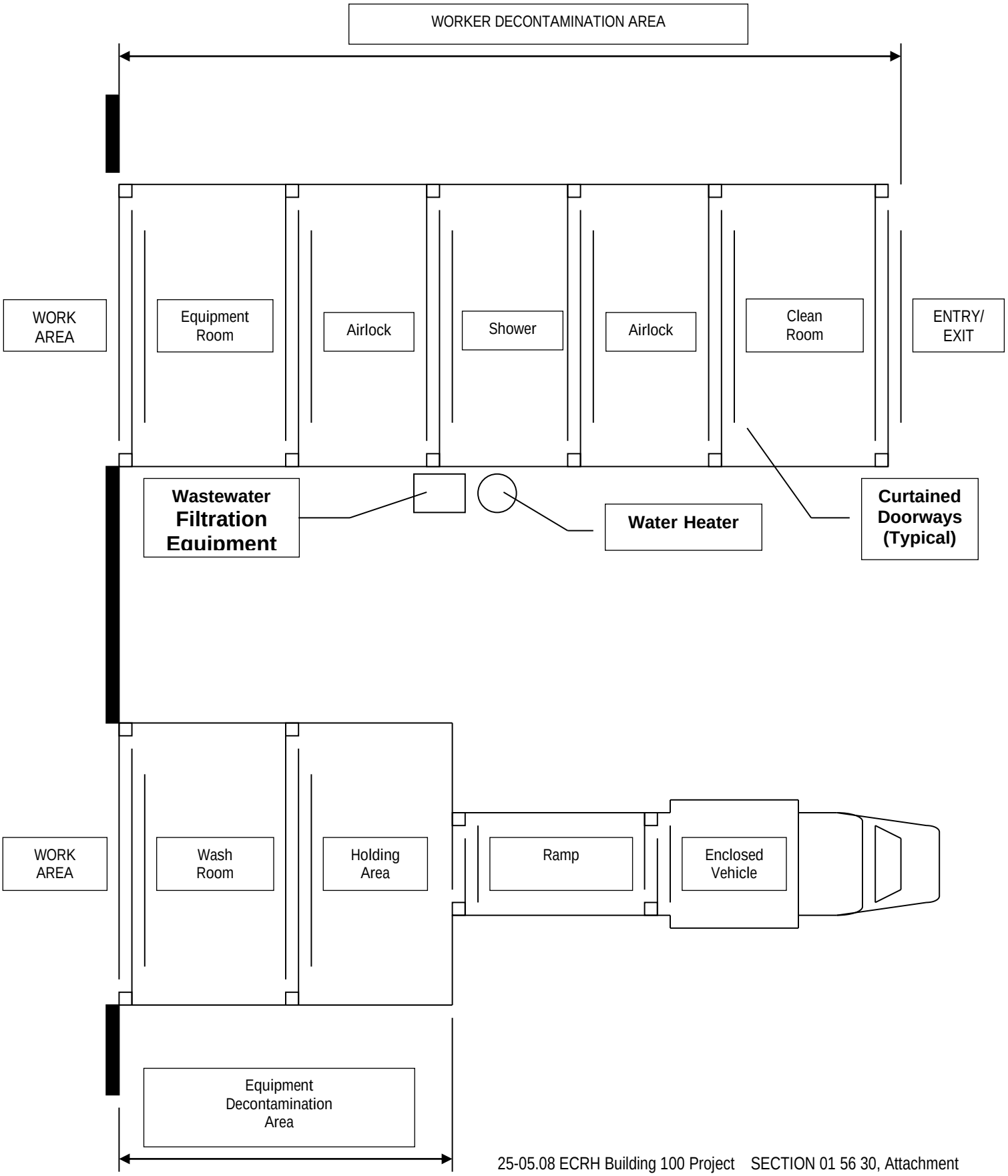
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END OF SECTION

SKETCH OF TYPICAL
PERSONNEL AND EQUIPMENT
DECONTAMINATION UNITS
FOR ASBESTOS ABATEMENT



DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 56 30 - DECONTAMINATION UNITS FOR ASBESTOS ABATEMENT

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E. Provide an airlock between shower room and equipment room. This is a transit area for workers.

F. Construct an equipment room and require work equipment, footwear, and additional contaminated work clothing to be left here. This is a change and transit area for workers.

G. Separate the regulated area from the equipment room by polyethylene barriers. If the airborne asbestos level in the regulated area is expected to be high, add an intermediate cleaning space between the equipment room and the regulated area. Damp wipe-clean all surfaces of the equipment room after each shift change. Provide one additional drop cloth of 6-mil polyethylene on the floor of the equipment room per shift change and remove contaminated layer after each shift.

3.02 DECONTAMINATION SEQUENCE

A. Require that all workers adhere to the following sequence when entering or leaving the regulated area.

1. Worker enters clean room and removes street clothing, puts on clean disposable coveralls and respirator, and passes through the airlock to the shower room, through a second airlock and into the equipment room.

2. Any additional clothing and equipment left in the equipment room needed by the worker are retrieved at this time.

3. Worker proceeds to regulated area.

4. Before leaving the regulated area, require the worker remove all gross contamination and debris from coveralls and feet.

5. The worker then proceeds to the equipment room and removes all clothing except respiratory protection equipment.

6. Extra work clothing such as boots, hard hats, goggles, and gloves are to be stored in contaminated end of the equipment room.

7. Disposable coveralls are placed in a bag for disposal with other waste material.

8. After showering and shampooing, the worker moves to the clean room and dresses in either new coveralls for another entry to the regulated area, or street clothes if leaving the work site.

3.03 EQUIPMENT DECONTAMINATION UNIT

A. Provide an equipment decontamination unit consisting of a serial arrangement of rooms (holding room, washroom, ramp) for removal of equipment and material from the regulated area. Do not allow personnel to enter or exit the regulated area through the equipment decontamination unit.

B. A schematic diagram of a typical equipment decontamination unit is illustrated in an attachment to this Section.

C. Provide an enclosed washroom located adjacent to the regulated area for cleaning of bagged or containerized asbestos-containing waste materials.

D. Provide a holding area separated from the adjacent rooms by flap doors fabricated from 6-mil polyethylene plastic sheeting.

E. Provide a load out area from the equipment decontamination unit to an enclosed truck or other suitable waste container.

3.04 LOAD OUT AREA

A. The load out area is the transfer area from the building to a truck or dumpster. It may be a ramp leading from the equipment decontamination unit, a separate room, or a loading dock area.

B. During transfer of material from the load out area, erect primary barriers as necessary to seal path from load out area to truck or dumpster.

3.05 SIGNS

A. Post an approximately 20 inch by 14-inch manufactured caution sign at each entrance to the regulated area displaying the following legend as required by 29 CFR 1926.1101. Provide signs as follow:

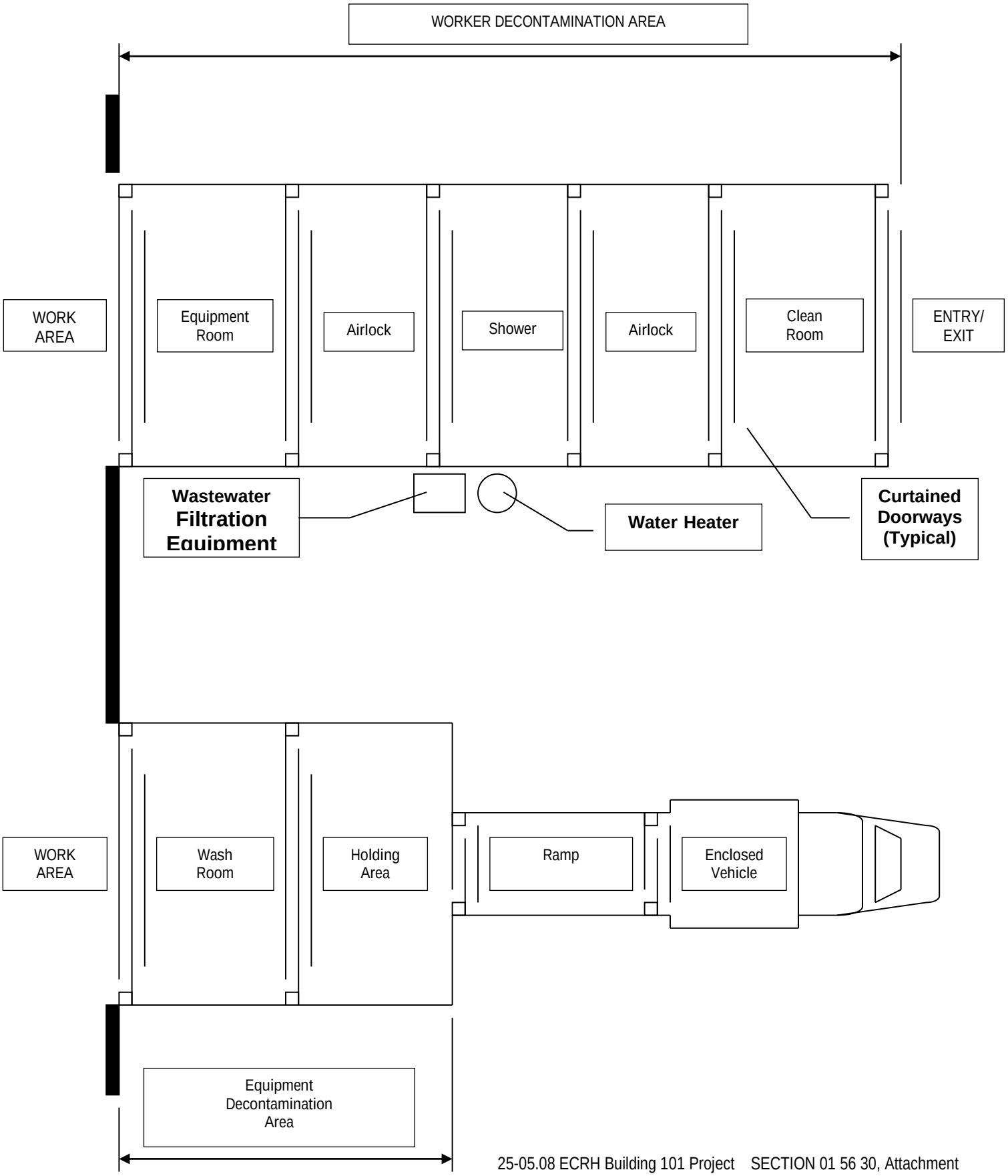
DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA
AUTHORIZED PERSONNEL ONLY

B. Post an approximately 10 inch by 14-inch manufactured sign at each entrance to each regulated area displaying the following legend with letter sizes and styles of a visibility at least equal to the following:

Legend	Notation
NO FOOD, BEVERAGES OR TOBACCO PERMITTED	3/4" Block
ALL PERSONS SHALL DON PROTECTIVE CLOTHING (COVERINGS) BEFORE ENTERING THE REGULATED AREA	3/4" Block
ALL PERSONS SHALL SHOWER IMMEDIATELY AFTER LEAVING REGULATED AREA AND BEFORE ENTERING THE CHANGING AREA	3/4" Block

END OF SECTION

SKETCH OF TYPICAL
PERSONNEL AND EQUIPMENT
DECONTAMINATION UNITS
FOR ASBESTOS ABATEMENT



DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 56 30 - DECONTAMINATION UNITS FOR ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 GENERAL

A. Provide separate Personnel and Equipment Decontamination facilities during asbestos abatement on the site.

B. An area on the job site shall be set up for the decontamination of equipment used in the regulated area or was otherwise used to handle RACM during the removal of the structure. Such equipment would include track hoes, loaders, skid steers, dump trucks, container trucks, etc. that have come into contact with the asbestos debris from the demolition or the process of loading the material into lined containers. This area for equipment decontamination shall have a means of capturing the water for proper disposal. Proper disposal of this water must include using a 5-micron filter before placing in drums or adding to a sanitary sewer. If soil is affected by water runoff, it must be skimmed from impacted areas of the site and disposed of as PACM.

PART 2 - PRODUCTS

2.01 POLYETHYLENE PLASTIC SHEETING

A. Provide polyethylene plastic sheeting in the largest sheet size possible to minimize seams: 4-mil and 6-mil thickness, clear, frosted, and/or black as required.

B. Polyethylene plastic sheeting shall be flame resistant and conform to the National Fire Protection Association Standard 701, "Small-Scale Fire Test for Flame-Resistant Textiles and Films".

2.02 ADHESIVES

A. Duct tape shall be a minimum of 1.5 inches wide with an adhesive formulated to stick aggressively to polyethylene plastic sheeting.

B. Spray adhesives shall be formulated to stick aggressively to polyethylene plastic sheeting.

PART 3 - EXECUTION

3.01 PERSONNEL DECONTAMINATION UNIT

A. Provide a personnel decontamination unit consisting of a serial arrangement of connected rooms or spaces (clean [change] room, shower room, equipment [dirty] room) separated from each other and from the regulated area by airlocks. A schematic diagram of a typical decontamination unit is illustrated in an attachment to this section. Require all persons without exception to pass through this decontamination unit for entry into and exiting from the regulated area for any purpose. Provide temporary lighting within decontamination units as necessary to reach a lighting level of 100-foot candles.

B. Provide a clean room the purpose of changing into protective clothing.

C. Provide an airlock between the shower room and clean room. This is a transit area for workers. An airlock is a system for permitting entrance and exit with minimum air movement between a contaminated area and an uncontaminated area, typically consisting of two curtained doorways separated by a distance of at least three (3) feet.

D. Provide a watertight operational shower to be used for transit by cleanly dressed workers heading for the regulated area from the clean room, or for showering by workers headed out of the regulated area after

undressing in the equipment room. Contaminated water from the shower room shall be either drummed or filtered with a 5-micron filter before being discharged to a sanitary sewer No water shall be allowed to leak or drain outside of the regulated area or the shower room.

E. Provide an airlock between shower room and equipment room. This is a transit area for workers.

F. Construct an equipment room and require work equipment, footwear, and additional contaminated work clothing to be left here. This is a change and transit area for workers.

G. Separate the regulated area from the equipment room by polyethylene barriers. If the airborne asbestos level in the regulated area is expected to be high, add an intermediate cleaning space between the equipment room and the regulated area. Damp wipe-clean all surfaces of the equipment room after each shift change. Provide one additional drop cloth of 6-mil polyethylene on the floor of the equipment room per shift change and remove contaminated layer after each shift.

3.02 DECONTAMINATION SEQUENCE

A. Require that all workers adhere to the following sequence when entering or leaving the regulated area.

1. Worker enters clean room and removes street clothing, puts on clean disposable coveralls and respirator, and passes through the airlock to the shower room, through a second airlock and into the equipment room.

2. Any additional clothing and equipment left in the equipment room needed by the worker are retrieved at this time.

3. Worker proceeds to regulated area.

4. Before leaving the regulated area, require the worker remove all gross contamination and debris from coveralls and feet.

5. The worker then proceeds to the equipment room and removes all clothing except respiratory protection equipment.

6. Extra work clothing such as boots, hard hats, goggles, and gloves are to be stored in contaminated end of the equipment room.

7. Disposable coveralls are placed in a bag for disposal with other waste material.

8. After showering and shampooing, the worker moves to the clean room and dresses in either new coveralls for another entry to the regulated area, or street clothes if leaving the work site.

3.03 EQUIPMENT DECONTAMINATION UNIT

A. Provide an equipment decontamination unit consisting of a serial arrangement of rooms (holding room, washroom, ramp) for removal of equipment and material from the regulated area. Do not allow personnel to enter or exit the regulated area through the equipment decontamination unit.

B. A schematic diagram of a typical equipment decontamination unit is illustrated in an attachment to this Section.

C. Provide an enclosed washroom located adjacent to the regulated area for cleaning of bagged or containerized asbestos-containing waste materials.

D. Provide a holding area separated from the adjacent rooms by flap doors fabricated from 6-mil polyethylene plastic sheeting.

E. Provide a load out area from the equipment decontamination unit to an enclosed truck or other suitable waste container.

3.04 LOAD OUT AREA

A. The load out area is the transfer area from the building to a truck or dumpster. It may be a ramp leading from the equipment decontamination unit, a separate room, or a loading dock area.

B. During transfer of material from the load out area, erect primary barriers as necessary to seal path from load out area to truck or dumpster.

3.05 SIGNS

A. Post an approximately 20 inch by 14-inch manufactured caution sign at each entrance to the regulated area displaying the following legend as required by 29 CFR 1926.1101. Provide signs as follow:

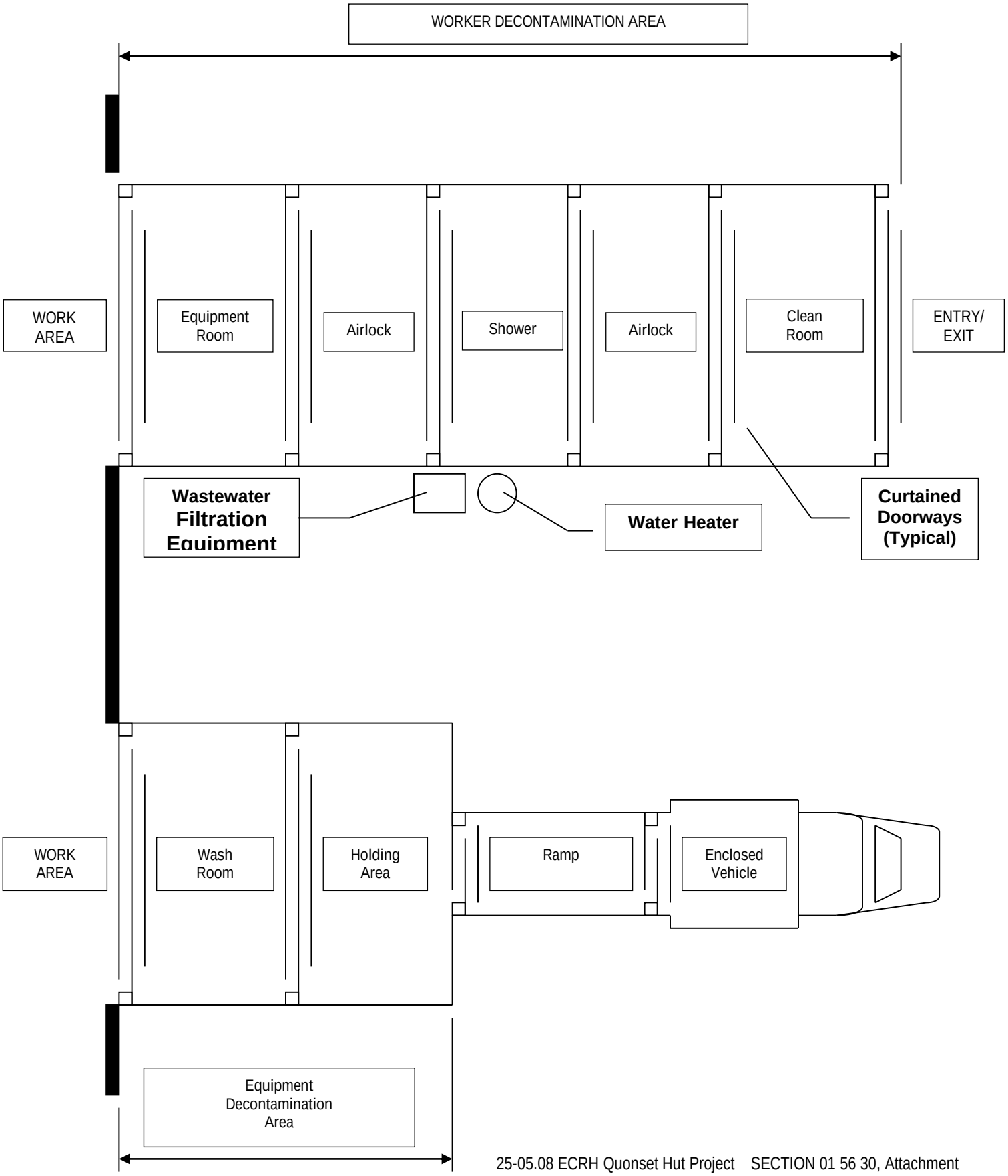
DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA
AUTHORIZED PERSONNEL ONLY

B. Post an approximately 10 inch by 14-inch manufactured sign at each entrance to each regulated area displaying the following legend with letter sizes and styles of a visibility at least equal to the following:

Legend	Notation
NO FOOD, BEVERAGES OR TOBACCO PERMITTED	3/4" Block
ALL PERSONS SHALL DON PROTECTIVE CLOTHING (COVERINGS) BEFORE ENTERING THE REGULATED AREA	3/4" Block
ALL PERSONS SHALL SHOWER IMMEDIATELY AFTER LEAVING REGULATED AREA AND BEFORE ENTERING THE CHANGING AREA	3/4" Block

END OF SECTION

SKETCH OF TYPICAL
PERSONNEL AND EQUIPMENT
DECONTAMINATION UNITS
FOR ASBESTOS ABATEMENT



DIVISION 1 – GENERAL REQUIREMENTS
SECTION 01 57 19 – TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section specifies the control of environmental pollution and damage that the Contractor must consider for air, water, and land resources. It includes management of visual aesthetics, noise, and solid waste, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various contract items of work.

B. Environmental pollution and damage are defined as the presence of chemical, physical, or biological elements or agents which:
1. Adversely affect human health or welfare.
2. Unfavorably alter ecological balances of importance to human life.
3. Affect other species of importance to humankind.
4. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.

1.2 DEFINITIONS OF POLLUTANTS

A. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.

B. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.

C. Sediment: Soil and other debris that has been eroded and transported by runoff water.

D. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from project construction activities.

E. Surface Discharge: The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and require a permit to discharge water from the governing agency.

F. Rubbish: Combustible and noncombustible wastes such as, but not limited to, paper, plastic, metal and plastic containers and cans, boxes, metal and lumber scrap.

G. Sanitary Wastes: Domestic Sanitary Sewage.

1.3 QUALITY CONTROL

A. Establish and maintain quality control for the environmental protection of all items set forth herein.

B. Record on daily reports any problems in complying with laws, regulations, ordinances and note any corrective action taken.

1.4 REFERENCES

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

B. U.S. National Archives and Records Administration (NARA):
33 CFR 328 Definitions, Waters of the United States.

C. Federal Environmental Regulatory Requirements: Comply with applicable regulations. The following is for Contractor's information only:
1. Storm water permits; refer to The Office of Wastewater Management, NPDES Storm Water Program.
2. RCRA hazardous and non-hazardous solid waste requirements; refer to EPA's Office of Solid Waste and Emergency Response.
3. Oil spill requirements for construction activities; refer to EPA Oil Program web site.
4. Hazardous substances (Superfund Liability) requirements for construction activities; refer to EPA's Superfund website.
5. Polychlorinated Biphenyl (PCB) waste requirements; refer to EPA's Polychlorinated Biphenyl (PCB) Homepage.
6. Air quality requirements for construction activities; refer to EPA'S Air Program Mobile Sources Page.
7. National Environmental Policy Act (NEPA) requirements for construction activities.
8. National Historic Preservation Act.

D. State and Local Environmental Regulatory Requirements: Comply with applicable regulations. The following is for Contractor's information only:
1. State Office/Department of Environmental Quality.
2. Local Office/Department of Environmental Quality.
3. The Construction Industry Compliance Assistance Center.
4. The National Environmental Compliance Assistance Clearinghouse.

1.5 SUBMITTALS

A. In accordance with Section, 01 33 00 "Submittals", the Contractor shall furnish the following:
1. Environmental Protection Plan: After the contract is awarded and prior to the commencement of the work, meet with the A/E to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Not more than 20 days after the meeting, prepare and submit to the A/E, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:
   a. Name(s) and qualifications of person(s) within the Contractor's organization who is (are) responsible for:
      1) Ensuring adherence to the Environmental Protection Plan.
      2) Manifesting hazardous waste to be removed from the site.
      3) Training the Contractor's environmental protection personnel.
   b. Description of the Contractor's environmental protection personnel training program.
   c. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control, noise control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.
   d. Methods for protection of features to be preserved within authorized work areas including trees, shrubs, vines, grasses, ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.
   e. Procedures to provide environmental protection that complies with the applicable laws and regulations. Describe the procedures to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures as described in the Environmental Protection Plan.
   f. Permits, licenses, and the location of the solid waste disposal area.
   g. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials. Include as part of an Erosion Control Plan approved by the District Office of the U.S. Soil Conservation Service and/or mandated state agency, and the Department of Veterans Affairs.
   h. Environmental Monitoring Plans for the job site including land, water, air, and noise.

i. Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of construction limits or protected areas. Plan should include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.

B. Within 20 days after the date of its submittal, the A/E shall approve the Contractor's Comprehensive Environmental Protection Plan, or respond with an explanation for its rejection and resubmittal.

C. Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

1.6 PROTECTION OF ENVIRONMENTAL RESOURCES

A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract and after the project is complete, based upon leaving the site that has yet to mature of hydroseeding. Confine construction activities to areas defined by construction limits, the specifications and drawings.

B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, land forms, wetlands or wetland buffers without prior approval from the A/E. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or dictated by special emergency use.

1. Work Area Limits: Prior to any construction, mark/fence/protect the areas that require work to be performed under this contract. Prior to construction, mark/fence/protect monuments, works of art, and any other markers to remain. Convey to all personnel the purpose of marking and protecting all marked and protected objects.
2. Protection of Specific Regulated Elements: Wetlands and wetland buffers and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved protective techniques.
    a. Protect trees and shrubs to remain on site to protect from damage per contract details.
    b. All damage to existing trees and shrubs shall be immediately repaired by trimming, cleaning, and painting with antiseptic tree paint.
    c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas only as needed to use to work the area to be developed. Form earthwork to final grade as shown as quickly as possible to minimize potential erosion damage. Immediately protect side slopes and back slopes upon completion of rough grading or clearing with appropriate material as defined in the Sediment and Erosion Control Plan.
4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, check dams and berms to retard and divert runoff from the construction site to protected drainage areas as intended under paragraph 208 of the Clean Water Act.
    a. Sediment Basins: Trap sediment from construction areas in temporary or permanent sediment basins that accommodate the runoff of a local 25-year (design year) storm. After each storm, pump the basins dry and remove the accumulated sediment. Control overflow/drainage with paved weirs or by vertical overflow pipes, that drain from the surface of the basin.
    b. Reuse or conserve the collected topsoil sediment as directed by the A/E. Topsoil use and requirements are specified in Section 31 20 00, "Earthwork".
    c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.
5. Erosion and Sedimentation Control Devices: Construct or install all temporary and permanent erosion and sedimentation control features shown on the Environmental Protection Plan to avoid violating water quality in accordance with federal and state regulations. Maintain temporary erosion and sediment control measures such as berms,

dikes, drains, sedimentation basins, grassing, and mulching, straw waddles, fiber rolls, until permanent drainage and erosion control facilities are completed and operative.

6. Manage and control borrow and spoil areas on Government property to minimize erosion and to prevent soil and/or sediment from entering nearby water courses or lakes.
7. Protect adjacent areas from despoilment by temporary excavations and embankments.
8. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
9. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
10. Handle discarded materials other than those included in the solid waste category as directed by the A/E.

C. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this contract.

1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in sediment basins prior to entering retention/detention ponds, allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
2. Monitor water areas, wetlands and wetland buffers affected by construction.

D. Protection of Fish and Wildlife Resources: Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife. Prior to beginning construction operations, list protected species that require specific attention along with measures for their protection.

E. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of Georgia and title of State Air Pollution Statue, Rule, or Regulation and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.

1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials at all times, including weekends, holidays, and hours when work is not in progress.
2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, or other methods are permitted to control particulates in the work area as approved in the Environmental Protection Plan.
3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.

F. Noise Control: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the A/E.

G. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.

H. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition as approved by the

A/E. The site shall be left meeting the requirements of the local and state environmental requirements associated with the (SWPPP) Storm Water Pollution Protection Plan as submitted. Cleaning shall include off-cemetery disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations, clearing, logging and general construction in accordance with state and local regulations and the contract.

END OF SECTION

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 01 60 00 – PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing selection of materials and color schedules for the work but not limited to, the following:
   1. Substitution Procedures.

1.2 SUBMITTALS

A. Qualification Data: For material and color substitutions.

B. Certificates:
   1. Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
   2. Submit Certificate of BABAA Compliance with Manufacturer's Product Certification Letter on Manufacturer's letterhead.

1.3 QUALITY ASSURANCE

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

B. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design", including make or model number or other designation, to establish the significant qualities related to type, function, dimensions, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

C. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
   1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
   2. Form: Tabulate information for each product under the following column headings:
      a. Specification Section number and title.
      b. Generic name used in the Contract Documents.
      c. Proprietary name, model number, and similar designations.
      d. Manufacturer's name and address.
      e. Supplier's name and address
      f. Installer's name and address.

PART 2 – PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
   1. Provide products complete with accessories, trim, 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.

5. Where products are accompanied by the term "match sample" sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:
1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturer's names, provide a product by one of the manufacturers listed that compiles with requirements.
5. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2.2 "Product Substitutions" Article for consideration of an unnamed product or system.
6. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified 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 provisions in Part 2.2 "Product Substitutions" Article for consideration of an unnamed product by the other named manufacturers.
7. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2.2 "Product Substitutions" Article for proposal of product.
8. Visual Selection Specification: Where Specification includes the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 10 days prior to Bid. Requests received after that time may be considered or rejected at discretion of Architect and Owner with monetary credit unless products are unavailable.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements.
1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Work shall not require redesign and evaluation or increased cost.

2. Requested substitution does not require revisions to the contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution provides specified warranty.
8. If requested substitution involves more than one sub-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.
9. Substitution request fully complies with BABAA and is properly documented as noted in Part 1.2 "Submittals".

PART 3 – EXECUTION (Not Used)

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS
SECTION 01 70 00 – EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. General installation of products.
   4. Occupancy and continued use.
   5. Progress cleaning.
   6. Starting and adjusting.
   7. Protection of the installed construction.
   8. Correction of the Work.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
   1. Before construction, verify the location and points of connection of all utility services.

B. Existing Utilities: 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 and other construction affecting the Work.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, water-service piping; and underground electrical services.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: 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. Examine rough-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   3. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility 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, submit a "Request for Information" to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Use standard form & numbering and dated.

E. Conflicts:
1. Contractor is to refer to the Contract or Special Conditions in regards to inconsistencies among the Contract Documents.
2. ALL conflicts noted shall be promptly reported to the Design Professional.

F. Match Existing:
1. Where materials are noted in Contract Documents to "match existing", Contractor to provide physical samples of new materials for color approval prior to purchasing or installing.
2. Installed materials that have **not** been approved shall be replaced **at no cost** to the Owner.

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 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 dimension within tolerances indicated. **Do not scale Drawings to obtain required dimensions.**
3. Inform installer 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 invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, foundations, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels.

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. Identification: Contractor will identify and confirm existing benchmarks, control points, and property corners.

B. 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.
   1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
   2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Final Property Survey: Prepare a final survey showing significant new features for Project. Include on the survey a certification, signed by land surveyor that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
   1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

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.
   4. Maintain minimum headroom clearance of 8ft (2.4m) in spaces without a suspended ceiling.

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. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
   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 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold materials more than 7 days during normal weather or 3 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 and vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean and protected. Clean installed surfaces according to written instruction 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: Burying or burning waste materials on site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

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.

J. Limiting Exposure: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to unauthorized access by non-construction personnel during the construction period.

3.7 SEQUENCE OF WORK

A. Phasing sequence is defined and to be confirmed by contractor for review/approval by owner. This plan will include but is not limited to:

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 operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacture's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with manufacturers qualification requirements.

3.9 PROTECTIVE 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 instruction 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. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

C. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 71 10 - PROJECT DECONTAMINATION FOR ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF REQUIREMENTS

A. The scope of work involves the abatement of friable and non-friable asbestos-containing materials. The material shall be thoroughly wetted with amended water prior to and during removal. The decontamination procedure is a three-step cleaning process.

B. Operation of an air filtration system shall be used to create diminished pressure and to move contaminated air away from the workers' breathing zone. Diminished pressure must be maintained for the duration of the project. Duration for the project shall be considered from the time critical barrier construction is completed through the time acceptable final clearance air monitoring results are obtained.

1.02 REGULATED AREA CLEARANCE

A. Air testing and other requirements that must be met before release of the Contractor and reoccupying the area are specified in SECTION 01 71 40 REGULATED AREA CLEARANCE. This shall be accomplished by PCM analysis.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 GENERAL

A. Work of this section includes decontamination of air in the regulated area which has been, or may have been, contaminated by elevated airborne asbestos fiber levels generated during abatement activities, or which may previously have had elevated fiber levels due to other sources of asbestos-containing materials in the space.

B. Work of this section includes the cleaning, decontamination, and removal of temporary facilities installed prior to abatement work, including:

1. Critical Barriers
2. Primary Barriers
3. Temporary Enclosures
4. Air Filtration System
5. Decontamination Units

3.02 START OF WORK

A. Work of this section begins with the cleaning of the regulated area with the following in place:

1. Critical barriers over openings, doorways, windows, HVAC ducts, etc.
2. Decontamination facilities for personnel and equipment in operating condition.
3. Air filtration system in operation.

3.03 FIRST CLEANING

A. Carry out a first cleaning of all surfaces in the regulated area by spraying a fine mist of amended water followed by wiping all surfaces with clean disposable rags or towels.

B. Immediately following this cleaning, remove primary barriers and the equipment decontamination unit leaving:

1. Critical barriers over openings, doorways, windows, HVAC ducts, etc.

2. Decontamination unit for personnel in operating condition.

3. Air filtration system in continuous operation.

3.04 SECOND CLEANING

A. Perform a second cleaning in the exact manner and order as the first cleaning.

3.05 ABATEMENT CONTRACTOR'S INSPECTION

A. Following this second cleaning, visually inspect all surfaces. Reclean if any dust, debris, etc., is found. Continue this cleaning process until no debris, dust or other material is found.

B. Wait 96 air changes to allow HEPA filtered fan units to clean air of airborne asbestos fibers. Maintain air filtration system in operation for the entire 96-air change period.

3.06 FINAL CLEANING

A. Carry out a final cleaning of all surfaces in the regulated area in the same manner as the previous cleaning.

3.07 VISUAL INSPECTION

A. After final cleaning perform a complete visual inspection of the entire regulated area including all surfaces as specified above; look for debris from any source, residue on surfaces, dust or other matter. When the area is visually clean, and no debris, residue, dust or other material is found, complete the certification at the end of this section. Visual inspection is not complete until confirmed in writing.

B. Provide a minimum of 100-foot candles of lighting on all surfaces in the areas to be subjected to visual inspection. Provide handheld lights providing 150-foot candles at 4 feet capable of reaching all locations in regulated area.

3.08 FINAL AIR CLEARANCE TESTING

A. After the regulated area is found to be visually clean and encapsulated in accordance with SECTION 02 08 10 - REMOVAL OF ASBESTOS CONTAINING MATERIALS, and been allowed to thoroughly dry, final air clearance samples will be taken and analyzed by PCM.

1. If Release Criteria are not met, repeat final cleaning and continue decontamination procedures from that point.

2. If Release Criteria are met, remove regulated area isolation.

3.09 REMOVAL OF REGULATED AREA ISOLATION

A. After all requirements of this section and requirements of SECTION 01 71 40 - REGULATED AREA CLEARANCE have been met:

1. Shut down and remove the air filtration system. Seal HEPA filtered fan units, HEPA vacuums and similar equipment with 6-mil polyethylene sheet and duct tape to form a tight seal at intake end before being moved from regulated area.

2. Remove critical barriers. Remove any small quantities of residual material found upon removal of the plastic sheeting by wet wiping, HEPA filtered vacuum cleaners and local area protection. If significant quantities, as determined by the Owner's Representative, are found then the entire area affected shall be decontaminated.

3. Remove all equipment, material, and debris from work site.

4. Dispose of all asbestos-containing waste material in accordance with Federal, State and Local regulations.

5. Perform a final inspection.

3.10 SUBSTANTIAL COMPLETION OF ABATEMENT WORK

A. Asbestos abatement work for each area is substantially complete upon meeting the requirements of this section and SECTION 01 71 40 - REGULATED AREA CLEARANCE, including submission of:

1. Certificate of Visual Inspection for each regulated area

2. Receipts documenting proper disposal of the asbestos containing waste at a licensed landfill

3. Punch list detailing repairs to be made and incomplete work to be performed

3.11 CERTIFICATE OF VISUAL INSPECTION

A. A Certificate of Visual Inspection shall be completed for each regulated area prior to collection of final air clearance samples. The attached certificate shall be completed by the Contractor and certified by a representative of the Owner.

END OF SECTION

CERTIFICATION OF VISUAL INSPECTION FOR ASBESTOS ABATEMENT

In accordance with SECTION 01 71 10 - PROJECT DECONTAMINATION, the Contractor hereby certifies that he has visually inspected all interior surfaces of the regulated area identified below and has found no dust, debris, or residue.

Area inspected: _____

By: (Signature): _____ Date: _____

(Print Name) _____

(Print Title) _____

OWNER'S REPRESENTATIVE'S CERTIFICATION

An authorized representative of the Owner hereby certifies that he has accompanied the Contractor on his visual inspection and verifies that this inspection has been thorough and to the best of his knowledge and belief, the Contractor's certification above is a true and honest one.

By: (Signature): _____ Date: _____

(Print Name) _____

(Print Title) _____

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 71 10 - PROJECT DECONTAMINATION FOR ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF REQUIREMENTS

A. The scope of work involves the abatement of friable and non-friable asbestos-containing materials. The material shall be thoroughly wetted with amended water prior to and during removal. The decontamination procedure is a three-step cleaning process.

B. Operation of an air filtration system shall be used to create diminished pressure and to move contaminated air away from the workers' breathing zone. Diminished pressure must be maintained for the duration of the project. Duration for the project shall be considered from the time critical barrier construction is completed through the time acceptable final clearance air monitoring results are obtained.

1.02 REGULATED AREA CLEARANCE

A. Air testing and other requirements that must be met before release of the Contractor and reoccupying the area are specified in SECTION 01 71 40 REGULATED AREA CLEARANCE. This shall be accomplished by PCM analysis.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 GENERAL

A. Work of this section includes decontamination of air in the regulated area which has been, or may have been, contaminated by elevated airborne asbestos fiber levels generated during abatement activities, or which may previously have had elevated fiber levels due to other sources of asbestos-containing materials in the space.

B. Work of this section includes the cleaning, decontamination, and removal of temporary facilities installed prior to abatement work, including:

1. Critical Barriers
2. Primary Barriers
3. Temporary Enclosures
4. Air Filtration System
5. Decontamination Units

3.02 START OF WORK

A. Work of this section begins with the cleaning of the regulated area with the following in place:

1. Critical barriers over openings, doorways, windows, HVAC ducts, etc.
2. Decontamination facilities for personnel and equipment in operating condition.
3. Air filtration system in operation.

3.03 FIRST CLEANING

A. Carry out a first cleaning of all surfaces in the regulated area by spraying a fine mist of amended water followed by wiping all surfaces with clean disposable rags or towels.

B. Immediately following this cleaning, remove primary barriers and the equipment decontamination unit leaving:

1. Critical barriers over openings, doorways, windows, HVAC ducts, etc.

2. Decontamination unit for personnel in operating condition.

3. Air filtration system in continuous operation.

3.04 SECOND CLEANING

A. Perform a second cleaning in the exact manner and order as the first cleaning.

3.05 ABATEMENT CONTRACTOR'S INSPECTION

A. Following this second cleaning, visually inspect all surfaces. Reclean if any dust, debris, etc., is found. Continue this cleaning process until no debris, dust or other material is found.

B. Wait 96 air changes to allow HEPA filtered fan units to clean air of airborne asbestos fibers. Maintain air filtration system in operation for the entire 96-air change period.

3.06 FINAL CLEANING

A. Carry out a final cleaning of all surfaces in the regulated area in the same manner as the previous cleaning.

3.07 VISUAL INSPECTION

A. After final cleaning perform a complete visual inspection of the entire regulated area including all surfaces as specified above; look for debris from any source, residue on surfaces, dust or other matter. When the area is visually clean, and no debris, residue, dust or other material is found, complete the certification at the end of this section. Visual inspection is not complete until confirmed in writing.

B. Provide a minimum of 100-foot candles of lighting on all surfaces in the areas to be subjected to visual inspection. Provide handheld lights providing 150-foot candles at 4 feet capable of reaching all locations in regulated area.

3.08 FINAL AIR CLEARANCE TESTING

A. After the regulated area is found to be visually clean and encapsulated in accordance with SECTION 02 08 10 - REMOVAL OF ASBESTOS CONTAINING MATERIALS, and been allowed to thoroughly dry, final air clearance samples will be taken and analyzed by PCM.

1. If Release Criteria are not met, repeat final cleaning and continue decontamination procedures from that point.

2. If Release Criteria are met, remove regulated area isolation.

3.09 REMOVAL OF REGULATED AREA ISOLATION

A. After all requirements of this section and requirements of SECTION 01 71 40 - REGULATED AREA CLEARANCE have been met:

1. Shut down and remove the air filtration system. Seal HEPA filtered fan units, HEPA vacuums and similar equipment with 6-mil polyethylene sheet and duct tape to form a tight seal at intake end before being moved from regulated area.

2. Remove critical barriers. Remove any small quantities of residual material found upon removal of the plastic sheeting by wet wiping, HEPA filtered vacuum cleaners and local area protection. If significant quantities, as determined by the Owner's Representative, are found then the entire area affected shall be decontaminated.

3. Remove all equipment, material, and debris from work site.

4. Dispose of all asbestos-containing waste material in accordance with Federal, State and Local regulations.

5. Perform a final inspection.

3.10 SUBSTANTIAL COMPLETION OF ABATEMENT WORK

A. Asbestos abatement work for each area is substantially complete upon meeting the requirements of this section and SECTION 01 71 40 - REGULATED AREA CLEARANCE, including submission of:

1. Certificate of Visual Inspection for each regulated area

2. Receipts documenting proper disposal of the asbestos containing waste at a licensed landfill

3. Punch list detailing repairs to be made and incomplete work to be performed

3.11 CERTIFICATE OF VISUAL INSPECTION

A. A Certificate of Visual Inspection shall be completed for each regulated area prior to collection of final air clearance samples. The attached certificate shall be completed by the Contractor and certified by a representative of the Owner.

END OF SECTION

CERTIFICATION OF VISUAL INSPECTION FOR ASBESTOS ABATEMENT

In accordance with SECTION 01 71 10 - PROJECT DECONTAMINATION, the Contractor hereby certifies that he has visually inspected all interior surfaces of the regulated area identified below and has found no dust, debris, or residue.

Area inspected: _____

By: (Signature): _____ Date: _____

(Print Name) _____

(Print Title) _____

OWNER'S REPRESENTATIVE'S CERTIFICATION

An authorized representative of the Owner hereby certifies that he has accompanied the Contractor on his visual inspection and verifies that this inspection has been thorough and to the best of his knowledge and belief, the Contractor's certification above is a true and honest one.

By: (Signature): _____ Date: _____

(Print Name) _____

(Print Title) _____

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 71 10 - PROJECT DECONTAMINATION FOR ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF REQUIREMENTS

A. The scope of work involves the abatement of friable and non-friable asbestos-containing materials. The material shall be thoroughly wetted with amended water prior to and during removal. The decontamination procedure is a three-step cleaning process.

B. Operation of an air filtration system shall be used to create diminished pressure and to move contaminated air away from the workers' breathing zone. Diminished pressure must be maintained for the duration of the project. Duration for the project shall be considered from the time critical barrier construction is completed through the time acceptable final clearance air monitoring results are obtained.

1.02 REGULATED AREA CLEARANCE

A. Air testing and other requirements that must be met before release of the Contractor and reoccupying the area are specified in SECTION 01 71 40 REGULATED AREA CLEARANCE. This shall be accomplished by PCM analysis.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 GENERAL

A. Work of this section includes decontamination of air in the regulated area which has been, or may have been, contaminated by elevated airborne asbestos fiber levels generated during abatement activities, or which may previously have had elevated fiber levels due to other sources of asbestos-containing materials in the space.

B. Work of this section includes the cleaning, decontamination, and removal of temporary facilities installed prior to abatement work, including:

1. Critical Barriers
2. Primary Barriers
3. Temporary Enclosures
4. Air Filtration System
5. Decontamination Units

3.02 START OF WORK

A. Work of this section begins with the cleaning of the regulated area with the following in place:

1. Critical barriers over openings, doorways, windows, HVAC ducts, etc.
2. Decontamination facilities for personnel and equipment in operating condition.
3. Air filtration system in operation.

3.03 FIRST CLEANING

A. Carry out a first cleaning of all surfaces in the regulated area by spraying a fine mist of amended water followed by wiping all surfaces with clean disposable rags or towels.

B. Immediately following this cleaning, remove primary barriers and the equipment decontamination unit leaving:

1. Critical barriers over openings, doorways, windows, HVAC ducts, etc.

2. Decontamination unit for personnel in operating condition.

3. Air filtration system in continuous operation.

3.04 SECOND CLEANING

A. Perform a second cleaning in the exact manner and order as the first cleaning.

3.05 ABATEMENT CONTRACTOR'S INSPECTION

A. Following this second cleaning, visually inspect all surfaces. Reclean if any dust, debris, etc., is found. Continue this cleaning process until no debris, dust or other material is found.

B. Wait 96 air changes to allow HEPA filtered fan units to clean air of airborne asbestos fibers. Maintain air filtration system in operation for the entire 96-air change period.

3.06 FINAL CLEANING

A. Carry out a final cleaning of all surfaces in the regulated area in the same manner as the previous cleaning.

3.07 VISUAL INSPECTION

A. After final cleaning perform a complete visual inspection of the entire regulated area including all surfaces as specified above; look for debris from any source, residue on surfaces, dust or other matter. When the area is visually clean, and no debris, residue, dust or other material is found, complete the certification at the end of this section. Visual inspection is not complete until confirmed in writing.

B. Provide a minimum of 100-foot candles of lighting on all surfaces in the areas to be subjected to visual inspection. Provide handheld lights providing 150-foot candles at 4 feet capable of reaching all locations in regulated area.

3.08 FINAL AIR CLEARANCE TESTING

A. After the regulated area is found to be visually clean and encapsulated in accordance with SECTION 02 08 10 - REMOVAL OF ASBESTOS CONTAINING MATERIALS, and been allowed to thoroughly dry, final air clearance samples will be taken and analyzed by PCM.

1. If Release Criteria are not met, repeat final cleaning and continue decontamination procedures from that point.

2. If Release Criteria are met, remove regulated area isolation.

3.09 REMOVAL OF REGULATED AREA ISOLATION

A. After all requirements of this section and requirements of SECTION 01 71 40 - REGULATED AREA CLEARANCE have been met:

1. Shut down and remove the air filtration system. Seal HEPA filtered fan units, HEPA vacuums and similar equipment with 6-mil polyethylene sheet and duct tape to form a tight seal at intake end before being moved from regulated area.

2. Remove critical barriers. Remove any small quantities of residual material found upon removal of the plastic sheeting by wet wiping, HEPA filtered vacuum cleaners and local area protection. If significant quantities, as determined by the Owner's Representative, are found then the entire area affected shall be decontaminated.

3. Remove all equipment, material, and debris from work site.

4. Dispose of all asbestos-containing waste material in accordance with Federal, State and Local regulations.

5. Perform a final inspection.

3.10 SUBSTANTIAL COMPLETION OF ABATEMENT WORK

A. Asbestos abatement work for each area is substantially complete upon meeting the requirements of this section and SECTION 01 71 40 - REGULATED AREA CLEARANCE, including submission of:

1. Certificate of Visual Inspection for each regulated area

2. Receipts documenting proper disposal of the asbestos containing waste at a licensed landfill

3. Punch list detailing repairs to be made and incomplete work to be performed

3.11 CERTIFICATE OF VISUAL INSPECTION

A. A Certificate of Visual Inspection shall be completed for each regulated area prior to collection of final air clearance samples. The attached certificate shall be completed by the Contractor and certified by a representative of the Owner.

END OF SECTION

CERTIFICATION OF VISUAL INSPECTION FOR ASBESTOS ABATEMENT

In accordance with SECTION 01 71 10 - PROJECT DECONTAMINATION, the Contractor hereby certifies that he has visually inspected all interior surfaces of the regulated area identified below and has found no dust, debris, or residue.

Area inspected: _____

By: (Signature): _____ Date: _____

(Print Name) _____

(Print Title) _____

OWNER'S REPRESENTATIVE'S CERTIFICATION

An authorized representative of the Owner hereby certifies that he has accompanied the Contractor on his visual inspection and verifies that this inspection has been thorough and to the best of his knowledge and belief, the Contractor's certification above is a true and honest one.

By: (Signature): _____ Date: _____

(Print Name) _____

(Print Title) _____

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 71 10 - PROJECT DECONTAMINATION FOR ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF REQUIREMENTS

A. The scope of work involves the removal of the entire structure as Regulated Asbestos-Containing Material (RACM).

B. An order must be issued by a State or local government official that the structure be demolished as RACM. Alternately, a professional engineer may make the determination that a facility is unsafe and recommend its removal as RACM. Reference 40 CFR 61.141, 61.145(a)(3) and 61.145(c)(4)-(9)

1.02 REGULATED AREA CLEARANCE

A. Air testing and other requirements that must be met before release of the Contractor are specified in SECTION 01 71 40 REGULATED AREA CLEARANCE. This shall be accomplished by visual certification of the Consultant and Abatement Supervisor.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 VISUAL INSPECTION

A. After final cleaning perform a complete visual inspection of the entire regulated area including all surfaces as specified above; look for debris from any source, residue on surfaces, dust or other matter. When the area is visually clean, and no debris, residue, dust or other material is found, complete the certification at the end of this section. Visual inspection is not complete until confirmed in writing.

3.02 REMOVAL OF REGULATED AREA ISOLATION

A. After all requirements of this section and requirements of SECTION 01 71 40 - REGULATED AREA CLEARANCE have been met, the Consultant and Abatement Supervisor shall perform a thorough inspection of the regulated area. No portion of the building, including the slab, shall remain. Only then can the regulated area barriers be removed.

3.03 CERTIFICATE OF VISUAL INSPECTION

A. A Certificate of Visual Inspection shall be completed for the regulated area. The attached certificate shall be completed by the Contractor and certified by a representative of the Owner or Consultant.

END OF SECTION

CERTIFICATION OF VISUAL INSPECTION FOR ASBESTOS ABATEMENT

In accordance with SECTION 01 71 10 - PROJECT DECONTAMINATION, the Contractor hereby certifies that he has visually inspected all surfaces of the regulated area identified below and has found no dust, debris, or residue.

Area inspected: _____

By: (Signature): _____ Date: _____

(Print Name) _____

(Print Title) _____

OWNER'S REPRESENTATIVE'S CERTIFICATION

An authorized representative of the Owner hereby certifies that he has accompanied the Contractor on his visual inspection and verifies that this inspection has been thorough and to the best of his knowledge and belief, the Contractor's certification above is a true and honest one.

By: (Signature): _____ Date: _____

(Print Name) _____

(Print Title) _____

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 71 40 - REGULATED AREA CLEARANCE FOR ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Certificate of Visual Inspection specified in SECTION 01 71 10 - PROJECT DECONTAMINATION.

1.02 SCOPE

A. This section describes work to be completed by an independent air monitoring and laboratory testing firm, sets forth required post-abatement airborne fiber concentration levels in the regulated areas, and describes testing procedures that will be used to measure these levels.

B. The laboratory selected for analyzing any TEM air samples shall possess current certification verifying their participation in the National Institute of Standards and Technology (NIST) and the National Voluntary Laboratory Accreditation Program (NVLAP).

1.03 CONTRACTOR RELEASE CRITERIA

A. The asbestos regulated area is cleared when the area is visually clean and airborne fiber concentrations have been reduced to the level specified below.

1.04 VISUAL INSPECTION

A. Work of this section will not begin until the visual inspection described in SECTION 01 71 10 - PROJECT DECONTAMINATION is complete and has been certified on behalf of the Owner and the regulated area has been allowed to thoroughly dry.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 FINAL AIR CLEARANCE SAMPLES

A. Final air clearance samples will be collected and analyzed by PCM after completion of all cleaning required in SECTION 01 71 10 PROJECT DECONTAMINATION.

B. The services of an independent air monitoring firm will collect and analyze final aggressive air clearance samples. A complete record, certified by the independent air monitoring firm, of all air monitoring tests and results will be furnished to the Owner upon completion of the project. Non-aggressive air sampling techniques may be used if conditions are warranted but will be indicated on the general notes on the plans.

3.02 TRANSMISSION ELECTRON MICROSCOPY FINAL CLEARANCE TESTING (REOCCUPANCY AREAS/NOT APPLICABLE TO DEMOLITION)

A. If required, Transmission Electron Microscopy (TEM) shall be used to analyze final air clearance samples from each regulated area where final air clearance samples are required. A minimum of five (5) samples and two (2) blanks shall be collected from each area using 25-mm cassettes. The collection media and sampling shall be in accordance with 40 CFR 763 (AHERA Requirements).

B. The regulated area shall be considered ready for re-occupancy if results of the average of the five (5) samples is less than or equal to 70 structures/millimeter squared of filter surface area.

C. If the above air clearance levels are not attained, the Contractor shall be required to re-clean the area and perform additional final clearance testing. Such re-cleaning and re-testing will be performed at no additional cost to the Owner. The air-monitoring firm will perform the additional final clearance testing and the cost of said monitoring deducted from the contract sums as a deductive change order.

3.03 PHASE CONTRAST MICROSCOPY FINAL CLEARANCE TESTING (REQUIRED)

A. Phase Contrast Microscopy (PCM) shall be used to analyze final air clearance samples from each regulated area where final air clearance samples are required. A minimum of five (5) samples and two (2) blanks shall be collected from each area using 25-mm cassettes. The collection media and sampling shall be in accordance with 40 CFR 763 (AHERA Requirements).

B. The regulated area shall be considered ready for re-occupancy if results of each sample is less than 0.01 fibers/cc.

C. If the above air clearance levels are not attained, the Contractor shall be required to re-clean the area and perform additional final clearance testing. Such re-cleaning and re-testing will be performed at no additional cost to the Owner. The air-monitoring firm will perform the additional final clearance testing and the cost of said monitoring deducted from the contract sums as a deductive change order.

3.04 FINAL INSPECTION

A. Once decontamination of the regulated area has been confirmed, the temporary asbestos control area shall be removed. A final inspection shall be performed in accordance with SECTION – 01 71 10 PROJECT DECONTAMINATION. Wet methods and/or HEPA vacuuming shall be used to clean any debris found.

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 71 40 - REGULATED AREA CLEARANCE FOR ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Certificate of Visual Inspection specified in SECTION 01 71 10 - PROJECT DECONTAMINATION.

1.02 SCOPE

A. This section describes work to be completed by an independent air monitoring and laboratory testing firm, sets forth required post-abatement airborne fiber concentration levels in the regulated areas, and describes testing procedures that will be used to measure these levels.

B. The laboratory selected for analyzing any TEM air samples shall possess current certification verifying their participation in the National Institute of Standards and Technology (NIST) and the National Voluntary Laboratory Accreditation Program (NVLAP).

1.03 CONTRACTOR RELEASE CRITERIA

A. The asbestos regulated area is cleared when the area is visually clean and airborne fiber concentrations have been reduced to the level specified below.

1.04 VISUAL INSPECTION

A. Work of this section will not begin until the visual inspection described in SECTION 01 71 10 - PROJECT DECONTAMINATION is complete and has been certified on behalf of the Owner and the regulated area has been allowed to thoroughly dry.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 FINAL AIR CLEARANCE SAMPLES

A. Final air clearance samples will be collected and analyzed by PCM after completion of all cleaning required in SECTION 01 71 10 PROJECT DECONTAMINATION.

B. The services of an independent air monitoring firm will collect and analyze final aggressive air clearance samples. A complete record, certified by the independent air monitoring firm, of all air monitoring tests and results will be furnished to the Owner upon completion of the project. Non-aggressive air sampling techniques may be used if conditions are warranted but will be indicated on the general notes on the plans.

3.02 TRANSMISSION ELECTRON MICROSCOPY FINAL CLEARANCE TESTING (REOCCUPANCY AREAS/NOT APPLICABLE TO DEMOLITION)

A. If required, Transmission Electron Microscopy (TEM) shall be used to analyze final air clearance samples from each regulated area where final air clearance samples are required. A minimum of five (5) samples and two (2) blanks shall be collected from each area using 25-mm cassettes. The collection media and sampling shall be in accordance with 40 CFR 763 (AHERA Requirements).

B. The regulated area shall be considered ready for re-occupancy if results of the average of the five (5) samples is less than or equal to 70 structures/millimeter squared of filter surface area.

C. If the above air clearance levels are not attained, the Contractor shall be required to re-clean the area and perform additional final clearance testing. Such re-cleaning and re-testing will be performed at no additional cost to the Owner. The air-monitoring firm will perform the additional final clearance testing and the cost of said monitoring deducted from the contract sums as a deductive change order.

3.03 PHASE CONTRAST MICROSCOPY FINAL CLEARANCE TESTING (REQUIRED)

A. Phase Contrast Microscopy (PCM) shall be used to analyze final air clearance samples from each regulated area where final air clearance samples are required. A minimum of five (5) samples and two (2) blanks shall be collected from each area using 25-mm cassettes. The collection media and sampling shall be in accordance with 40 CFR 763 (AHERA Requirements).

B. The regulated area shall be considered ready for re-occupancy if results of each sample is less than 0.01 fibers/cc.

C. If the above air clearance levels are not attained, the Contractor shall be required to re-clean the area and perform additional final clearance testing. Such re-cleaning and re-testing will be performed at no additional cost to the Owner. The air-monitoring firm will perform the additional final clearance testing and the cost of said monitoring deducted from the contract sums as a deductive change order.

3.04 FINAL INSPECTION

A. Once decontamination of the regulated area has been confirmed, the temporary asbestos control area shall be removed. A final inspection shall be performed in accordance with SECTION – 01 71 10 PROJECT DECONTAMINATION. Wet methods and/or HEPA vacuuming shall be used to clean any debris found.

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 71 40 - REGULATED AREA CLEARANCE FOR ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Certificate of Visual Inspection specified in SECTION 01 71 10 - PROJECT DECONTAMINATION.

1.02 SCOPE

A. This section describes work to be completed by an independent air monitoring and laboratory testing firm, sets forth required post-abatement airborne fiber concentration levels in the regulated areas, and describes testing procedures that will be used to measure these levels.

B. The laboratory selected for analyzing any TEM air samples shall possess current certification verifying their participation in the National Institute of Standards and Technology (NIST) and the National Voluntary Laboratory Accreditation Program (NVLAP).

1.03 CONTRACTOR RELEASE CRITERIA

A. The asbestos regulated area is cleared when the area is visually clean and airborne fiber concentrations have been reduced to the level specified below.

1.04 VISUAL INSPECTION

A. Work of this section will not begin until the visual inspection described in SECTION 01 71 10 - PROJECT DECONTAMINATION is complete and has been certified on behalf of the Owner and the regulated area has been allowed to thoroughly dry.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 FINAL AIR CLEARANCE SAMPLES

A. Final air clearance samples will be collected and analyzed by PCM after completion of all cleaning required in SECTION 01 71 10 PROJECT DECONTAMINATION.

B. The services of an independent air monitoring firm will collect and analyze final aggressive air clearance samples. A complete record, certified by the independent air monitoring firm, of all air monitoring tests and results will be furnished to the Owner upon completion of the project. Non-aggressive air sampling techniques may be used if conditions are warranted but will be indicated on the general notes on the plans.

3.02 TRANSMISSION ELECTRON MICROSCOPY FINAL CLEARANCE TESTING (REOCCUPANCY AREAS/NOT APPLICABLE TO DEMOLITION)

A. If required, Transmission Electron Microscopy (TEM) shall be used to analyze final air clearance samples from each regulated area where final air clearance samples are required. A minimum of five (5) samples and two (2) blanks shall be collected from each area using 25-mm cassettes. The collection media and sampling shall be in accordance with 40 CFR 763 (AHERA Requirements).

B. The regulated area shall be considered ready for re-occupancy if results of the average of the five (5) samples is less than or equal to 70 structures/millimeter squared of filter surface area.

C. If the above air clearance levels are not attained, the Contractor shall be required to re-clean the area and perform additional final clearance testing. Such re-cleaning and re-testing will be performed at no additional cost to the Owner. The air-monitoring firm will perform the additional final clearance testing and the cost of said monitoring deducted from the contract sums as a deductive change order.

3.03 PHASE CONTRAST MICROSCOPY FINAL CLEARANCE TESTING (REQUIRED)

A. Phase Contrast Microscopy (PCM) shall be used to analyze final air clearance samples from each regulated area where final air clearance samples are required. A minimum of five (5) samples and two (2) blanks shall be collected from each area using 25-mm cassettes. The collection media and sampling shall be in accordance with 40 CFR 763 (AHERA Requirements).

B. The regulated area shall be considered ready for re-occupancy if results of each sample is less than 0.01 fibers/cc.

C. If the above air clearance levels are not attained, the Contractor shall be required to re-clean the area and perform additional final clearance testing. Such re-cleaning and re-testing will be performed at no additional cost to the Owner. The air-monitoring firm will perform the additional final clearance testing and the cost of said monitoring deducted from the contract sums as a deductive change order.

3.04 FINAL INSPECTION

A. Once decontamination of the regulated area has been confirmed, the temporary asbestos control area shall be removed. A final inspection shall be performed in accordance with SECTION – 01 71 10 PROJECT DECONTAMINATION. Wet methods and/or HEPA vacuuming shall be used to clean any debris found.

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 71 40 - REGULATED AREA CLEARANCE FOR ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Certificate of Visual Inspection specified in SECTION 01 71 10 - PROJECT DECONTAMINATION.

1.02 SCOPE

A. This section describes work to be completed by an independent air monitoring and laboratory testing firm, sets forth airborne fiber concentration levels in the regulated areas, and describes testing procedures that will be used to measure these levels.

B. The laboratory selected for analyzing any TEM air samples shall possess current certification verifying their participation in the National Institute of Standards and Technology (NIST) and the National Voluntary Laboratory Accreditation Program (NVLAP).

1.03 CONTRACTOR RELEASE CRITERIA

A. The asbestos regulated area is cleared when the area is visually clean and airborne fiber concentrations have been reduced to the level specified below.

1.04 VISUAL INSPECTION

A. Work of this section will not begin until the visual inspection described in SECTION 01 71 10 - PROJECT DECONTAMINATION is complete and has been certified on behalf of the Owner and the regulated area has been allowed to thoroughly dry.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 FINAL AIR CLEARANCE SAMPLES

A. Final air clearance samples will be not necessary on this exterior work project. Final clearance shall be achieved via visual certification by the Consultant/Owner’s Representative and the Abatement Supervisor.

3.02 TRANSMISSION ELECTRON MICROSCOPY FINAL CLEARANCE TESTING (REOCCUPANCY AREAS/NOT APPLICABLE TO DEMOLITION)

A. Final air clearance samples will not be necessary on this exterior work project. Final clearance shall be achieved via visual certification by the Consultant/Owner’s Representative and the Abatement Supervisor.

3.03 PHASE CONTRAST MICROSCOPY FINAL CLEARANCE TESTING (REQUIRED)

A. Final clearance shall be achieved via visual certification by the parties listed above.

3.04 FINAL INSPECTION

A. Once decontamination of the regulated area has been confirmed, the temporary asbestos control area shall be removed.

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS
SECTION 01 74 00 – CLEANING AND WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Prior to final acceptance by the Owner, the building and surrounding grounds are to be put in clean and orderly condition. In all instances, the subcontractors are directly responsible for the neatness and orderliness of their work. However, it will be the General Contractor's final responsibility to ascertain the entire project is in a thoroughly clean and acceptable condition.

1.2 CLEANING OF METAL WORK

A. All exposed metal work shall be thoroughly cleaned before final acceptance of the project. During construction, all exposed metal, finish hardware and all other exposed finish metals shall be protected with polyethylene film, vaseline or other appropriate protective covering. Immediately prior to final acceptance, such metals shall be thoroughly cleaned. No damaged, scratched, stained, injured or discolored materials will be accepted and must be replaced.

1.3 CLEANING OF GLASS & GLAZING

A. All glasswork shall be cleaned thoroughly prior to final acceptance. Glass shall be cleaned inside and outside in accordance with glazing manufacturer's recommendations. Broken or scratched glazing shall be cause for rejection and requires replacement of the work. Clean away all excess construction materials and sealant. Clean and polish all mirrors.

1.4 EXTERIOR CLEANING

A. The grounds around the building, lay-down and work areas are to be left in a clean condition. Trash, debris, or unused materials are to be removed from the site. Included is the final cleaning of all existing work soiled or damaged by construction activities.

B. Restore all lawns and planting areas to match existing conditions.

1.5 FINAL CLEAN-UP

A. Prior to Architect's Final Inspection, execute final clean-up as follows:
1. Remove all debris from within building and building site.
2. Remove all stains, spots, marks, and dirt from finish surfaces of the work.
3. Remove all paint spots and smears from all surfaces.
4. Clean all fixtures and equipment.
5. Leave all carpeted floors vacuum clean and without stains.
6. Clean all resilient floors and base. Install sealer and was conforming to Campus standards.
5. Clean all counters, shelving, and cabinets, all surfaces inside and outside.
6. Replace damaged materials.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 01 77 00 – CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Inspection Procedures.
   2. Record Drawings.
   3. Closeout Documentation.
   4. Operations and Maintenance (O & M) Manuals.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, the Contractor shall complete the following:
   1. Prepare a list of items to be completed and corrected "Preliminary Punch List", indicate the value of items on the list, and reasons why the Work is not complete. The Architect will evaluate and add items as necessary at time of inspection.
   2. Advise Owner of pending insurance change over 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 "Red Lined Prints", operation and maintenance manuals, and similar final record information.
   6. Deliver tools, spare parts, extra materials, and similar items to a location designated by the Owner. Label with manufacturer's name and model number where applicable.
   7. Make final change over of permanent locks and deliver keys to Owner. Advise Owner's personnel of change over security provisions.
   8. Complete startup testing of systems.
   9. Submit test records and certify water systems sterilization tests.
   10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
   11. Advise Owner of change over in power and other utilities.
   12. Submit change over information related to Owner's occupancy, use, operation, and maintenance.
   13. Complete final cleaning requirements, including touch-up 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.
   1. Results of completed inspection will form the basis of requirements for Substantial Completion.
   2. Contractor shall identify the schedule to complete all work for certified "Final Completion".

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting Final Inspection for determining date of Final Completion, complete the following:
   1. Submit a Final Application for Payment according to Section 01 33 00 "Submittals"
   2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (Preliminary 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. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Provide documentation of training.

B. Inspection: Submit a written request for Final Inspection for acceptance. Indicate areas needing correction from Preliminary Punch List. Final inspection will require 48 hours prior notice.

1.4 LIST OF INCOMPLETE ITEMS (FINAL PUNCH LIST)

A. Contractor shall submit written estimated schedule for completion to the Owner and Architect. The Architect will coordinate a final review of the remaining items on the Final Punch List.

B. Subsequent inspections shall be at the Contractor's expense.

PART 2 – PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of prints of the Contract Drawings with incorporated Addenda and approved Change Orders.
   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 prepare the 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. Accurately record information in an understandable drawing technique.
      c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Revisions to routing of piping and conduits.
      d. Revisions to electrical circuitry.
      e. Actual equipment locations.
      f. Locations of concealed utilities.
      g. Changes made by Change Order or Change Directive.
      h. Changes made following Architect's written orders.
      i. Details not on the original Contract Drawings.
      j. Field records for variable and concealed conditions.
      k. Record information on the Work that is shown only schematically.
   3. Mark the Contract Drawings completely and accurately.
   4. Mark record set in red. Use other colors to distinguish between changes for different categories of the Work at same location.
   5. Mark important additional information that was either shown schematically or omitted from original Drawings.
   6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 CLOSEOUT DOCUMENTATION

A. Organization of Closeout Documents. Each item shall be indexed with tabs as indicated below in a 3-ring binder, two (2) completed copies (one containing original warranties), and three (3) flash drives containing a digital copy, shall be supplied to the Owner. Documents shall be organized and shall include but are not limited to the following:
   1. General [Tab1]
      1.0 Index
      1.1 Affidavits
         a. Non-Influence
         b. Statutory
      1.2 Lien Waivers (Contractor and Subcontractors)
      1.3 Consent of Surety for Final Payment
      1.4 Contractor's Warranty
      1.5 Certificate of Completion

1.6 List of major subcontractors with contact name, address and phone numbers.

2. Certificate of Build America, Buy America Act (BABAA) Compliance (Manufacturer's Product Certification Letter on Manufacturer's letterhead) as required, for each Submittal.
3. Refer to Section 01 33 00 "Submittals" for additional submittals and warranties.
4. Refer to each specification section for Close-Out and O & M information.
5. Final payment will not be processed or reviewed by Architect until **all** Closeout Documents and Operations and Maintenance manuals are completed.

B. The balance of the warranties, operations and maintenance material shall be divided into manageable sections and binders. See Section 01 33 00 "Submittals".

2.3 OPERATIONS AND MAINTENANCE MANUAL

A. Submit two copies of each manual. Label and index each manual. Include project title and date of submittal.
   1. Use heavy duty 3-ring binders to accommodate data. Provide protective sleeves for loose and odd sized manufacturer's information.
   2. Divide manuals into major categories, Divisions 1 – 33 per specification section:
      a. One tab per applicable division – see Table of Contents

B. Include all required warranties and manufacturers data as required per each section of the specification.
   1. Contractor shall review specification, log and track the necessary warranties.
   2. Architect will review submittal log with Owner for completeness.
   3. Include procedures to follow and required notifications for warranty claims.

C. Include copies of transmittals for required materials.

D. Include maintenance procedures for installed products.
   1. Inspection procedures.
   2. Types of cleaning agents to be used and method of cleaning.
   3. List of cleaning agents and methods of cleaning detrimental to product.
   4. Provide schedule for routine cleaning and maintenance.
   5. Repair instructions.

E. In addition, contractor is to provide (3) flash drives of scanned documents in PDF format.

END OF SECTION

SECTION 01 80 00

SITE CLEAN UP AND POST-PROJECT SUBMITTALS

PART 1 - GENERAL

1.01 DAMAGE REPAIR

A. Any damage to surfaces and/or building components, other than those designated for demolition, caused by the Contractor's activity or his workers, shall be repaired or replaced at no additional cost to the Owner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 FINAL CONSTRUCTION SITE CLEAN UP

A. Work of this section shall be performed once the Contractor has successfully passed all required final visual inspections and final air clearance testing of the regulated areas, and all asbestos-containing waste has been properly removed from the work site.

B. Prior to the Owner’s Representative's final inspection, the Contractor shall remove from within and around the building all debris, waste, trash, etc., generated by the Contractor's workers.

3.02 FINAL INSPECTION

A. The Owner's Representative shall set a date for the final inspection when a notice of readiness for final inspection is received from the Contractor. During this inspection the Owner's Representative shall make a written list of deficiencies.

B. When all deficient items have been corrected and accepted by the Owner's Representative, the Contractor may submit his application for payment.

3.03 SUBMITTAL DOCUMENTS

A. Four (4) copies of the following documents shall be submitted to the Owner via the Consultant prior to the start of work:

1. Copy of an approved notification for demolition and/or renovation from governing agency giving dates when removal will begin and be completed

2. Proof of insurance naming the Owner and Consultant as additional certificate holders

3. Copy of State of Georgia Asbestos Contractor's license

4. Copy of the asbestos supervisor(s) accreditation

5. Proof of asbestos worker training within the last 12 months for each employee involved in the project

6. Medical examination report for each employee of the Contractor who was involved in the project

7. Respirator training for each employee of the Contractor who was involved in the project

3.04 POST SUBMITTAL DOCUMENTS

A. Four (4) copies of the following documents shall be submitted to the Owner via the Consultant at the completion of the work:

1. "Worker Release Form" for each employee of the Contractor who was involved in the project

2. Safety Data Sheets for all hazardous chemicals incorporated in the work

3. Regulated area sign in/sign out sheets and daily logs maintained by the Contractor's asbestos abatement supervisor

4. Certificate of Visual Inspection for each regulated area signed by the Contractor and a representative of the Owner

5. Waste Shipment Records and Chain of Custody Forms for asbestos and lead waste

B. Pre- and Post-submittals shall be bound in three-ring binders with each section tabbed or separated by a colored sheet of paper and cross-referenced to an index. The cover shall be labeled with the project name and inclusive dates. The required submittals shall be forwarded to the Owner via the Consultant.

END OF SECTION

ADD ALTERNATE #4

CERTIFICATE OF WORKERS ACKNOWLEDGEMENT-ASBESTOS

PROJECT NAME: _____

PROJECT ADDRESS: _____

CONTRACTOR'S NAME: _____

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBERS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCER. IF YOU SMOKE AND INHALE ASBESTOS FIBERS THE CHANCE THAT YOU WILL DEVELOP LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.

Your employer's contract with the Owner for the above project requires that: You be supplied with the proper respirator and be trained in its use. You will be trained in safe work practices and in the use of the equipment found on the job. You will receive a medical examination. These things are to have been done at no cost to you.

RESPIRATORY PROTECTION: You must have been trained in the proper use of respirators, and informed of the type or respirator to be used on the above referenced project. You must be given a copy of the written respiratory protection manual issued by your employer. You must be equipped at no cost with the respirator to be used on the above project.

TRAINING COURSE: You must have been trained in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures and personal and area protective measures. The topics covered in the course must have included the following:

- Physical characteristics of asbestos
- Health hazards associated with asbestos
- Respiratory protection
- Use of protective equipment
- Pressure Differential Systems
- Work practices including hands-on or on-job training
- Personal decontamination procedures
- Air monitoring, personal and area

MEDICAL EXAMINATION: You must have had a medical examination within 12 months at no cost to you. The examination must have included: Health history, pulmonary function tests, and may have included an evaluation of a chest x-ray.

By signing this document you are acknowledging only that the Owner of the building you are about to work in has advised you of your rights to training and protection relative to your employer, the Contractor.

SIGNATURE_____

SOCIAL SECURITY No.: XXX-XX-_____

PRINT NAME: _____

WITNESS: _____

SECTION 01 80 00

SITE CLEAN UP AND POST-PROJECT SUBMITTALS

PART 1 - GENERAL

1.01 DAMAGE REPAIR

A. Any damage to surfaces and/or building components, other than those designated for demolition, caused by the Contractor's activity or his workers, shall be repaired or replaced at no additional cost to the Owner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 FINAL CONSTRUCTION SITE CLEAN UP

A. Work of this section shall be performed once the Contractor has successfully passed all required final visual inspections and final air clearance testing of the regulated areas, and all asbestos-containing waste has been properly removed from the work site.

B. Prior to the Owner’s Representative's final inspection, the Contractor shall remove from within and around the building all debris, waste, trash, etc., generated by the Contractor's workers.

3.02 FINAL INSPECTION

A. The Owner's Representative shall set a date for the final inspection when a notice of readiness for final inspection is received from the Contractor. During this inspection the Owner's Representative shall make a written list of deficiencies.

B. When all deficient items have been corrected and accepted by the Owner's Representative, the Contractor may submit his application for payment.

3.03 SUBMITTAL DOCUMENTS

A. Four (4) copies of the following documents shall be submitted to the Owner via the Consultant prior to the start of work:

1. Copy of an approved notification for demolition and/or renovation from governing agency giving dates when removal will begin and be completed

2. Proof of insurance naming the Owner and Consultant as additional certificate holders

3. Copy of State of Georgia Asbestos Contractor's license

4. Copy of the asbestos supervisor(s) accreditation

5. Proof of asbestos worker training within the last 12 months for each employee involved in the project

6. Medical examination report for each employee of the Contractor who was involved in the project

7. Respirator training for each employee of the Contractor who was involved in the project

3.04 POST SUBMITTAL DOCUMENTS

A. Four (4) copies of the following documents shall be submitted to the Owner via the Consultant at the completion of the work:

1. "Worker Release Form" for each employee of the Contractor who was involved in the project

2. Safety Data Sheets for all hazardous chemicals incorporated in the work

3. Regulated area sign in/sign out sheets and daily logs maintained by the Contractor's asbestos abatement supervisor

4. Certificate of Visual Inspection for each regulated area signed by the Contractor and a representative of the Owner

5. Waste Shipment Records and Chain of Custody Forms for asbestos and lead waste

B. Pre- and Post-submittals shall be bound in three-ring binders with each section tabbed or separated by a colored sheet of paper and cross-referenced to an index. The cover shall be labeled with the project name and inclusive dates. The required submittals shall be forwarded to the Owner via the Consultant.

END OF SECTION

ADD ALTERNATE #4

CERTIFICATE OF WORKERS ACKNOWLEDGEMENT-ASBESTOS

PROJECT NAME: _____

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CONTRACTOR'S NAME: _____

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBERS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCER. IF YOU SMOKE AND INHALE ASBESTOS FIBERS THE CHANCE THAT YOU WILL DEVELOP LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.

Your employer's contract with the Owner for the above project requires that: You be supplied with the proper respirator and be trained in its use. You will be trained in safe work practices and in the use of the equipment found on the job. You will receive a medical examination. These things are to have been done at no cost to you.

RESPIRATORY PROTECTION: You must have been trained in the proper use of respirators, and informed of the type or respirator to be used on the above referenced project. You must be given a copy of the written respiratory protection manual issued by your employer. You must be equipped at no cost with the respirator to be used on the above project.

TRAINING COURSE: You must have been trained in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures and personal and area protective measures. The topics covered in the course must have included the following:

- Physical characteristics of asbestos
- Health hazards associated with asbestos
- Respiratory protection
- Use of protective equipment
- Pressure Differential Systems
- Work practices including hands-on or on-job training
- Personal decontamination procedures
- Air monitoring, personal and area

MEDICAL EXAMINATION: You must have had a medical examination within 12 months at no cost to you. The examination must have included: Health history, pulmonary function tests, and may have included an evaluation of a chest x-ray.

By signing this document you are acknowledging only that the Owner of the building you are about to work in has advised you of your rights to training and protection relative to your employer, the Contractor.

SIGNATURE_____

SOCIAL SECURITY No.: XXX-XX-_____

PRINT NAME: _____

WITNESS: _____

SECTION 01 80 00

SITE CLEAN UP AND POST-PROJECT SUBMITTALS

PART 1 - GENERAL

1.01 DAMAGE REPAIR

A. Any damage to surfaces and/or building components, other than those designated for demolition, caused by the Contractor's activity or his workers, shall be repaired or replaced at no additional cost to the Owner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 FINAL CONSTRUCTION SITE CLEAN UP

A. Work of this section shall be performed once the Contractor has successfully passed all required final visual inspections and final air clearance testing of the regulated areas, and all asbestos-containing waste has been properly removed from the work site.

B. Prior to the Owner’s Representative's final inspection, the Contractor shall remove from within and around the building all debris, waste, trash, etc., generated by the Contractor's workers.

3.02 FINAL INSPECTION

A. The Owner's Representative shall set a date for the final inspection when a notice of readiness for final inspection is received from the Contractor. During this inspection the Owner's Representative shall make a written list of deficiencies.

B. When all deficient items have been corrected and accepted by the Owner's Representative, the Contractor may submit his application for payment.

3.03 SUBMITTAL DOCUMENTS

A. Four (4) copies of the following documents shall be submitted to the Owner via the Consultant prior to the start of work:

1. Copy of an approved notification for demolition and/or renovation from governing agency giving dates when removal will begin and be completed

2. Proof of insurance naming the Owner and Consultant as additional certificate holders

3. Copy of State of Georgia Asbestos Contractor's license

4. Copy of the asbestos supervisor(s) accreditation

5. Proof of asbestos worker training within the last 12 months for each employee involved in the project

6. Medical examination report for each employee of the Contractor who was involved in the project

7. Respirator training for each employee of the Contractor who was involved in the project

3.04 POST SUBMITTAL DOCUMENTS

A. Four (4) copies of the following documents shall be submitted to the Owner via the Consultant at the completion of the work:

1. "Worker Release Form" for each employee of the Contractor who was involved in the project

2. Safety Data Sheets for all hazardous chemicals incorporated in the work

3. Regulated area sign in/sign out sheets and daily logs maintained by the Contractor's asbestos abatement supervisor

4. Certificate of Visual Inspection for each regulated area signed by the Contractor and a representative of the Owner

5. Waste Shipment Records and Chain of Custody Forms for asbestos and lead waste

B. Pre- and Post-submittals shall be bound in three-ring binders with each section tabbed or separated by a colored sheet of paper and cross-referenced to an index. The cover shall be labeled with the project name and inclusive dates. The required submittals shall be forwarded to the Owner via the Consultant.

END OF SECTION

ADD ALTERNATE #4

CERTIFICATE OF WORKERS ACKNOWLEDGEMENT-ASBESTOS

PROJECT NAME: _____

PROJECT ADDRESS: _____

CONTRACTOR'S NAME: _____

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBERS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCER. IF YOU SMOKE AND INHALE ASBESTOS FIBERS THE CHANCE THAT YOU WILL DEVELOP LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.

Your employer's contract with the Owner for the above project requires that: You be supplied with the proper respirator and be trained in its use. You will be trained in safe work practices and in the use of the equipment found on the job. You will receive a medical examination. These things are to have been done at no cost to you.

RESPIRATORY PROTECTION: You must have been trained in the proper use of respirators, and informed of the type or respirator to be used on the above referenced project. You must be given a copy of the written respiratory protection manual issued by your employer. You must be equipped at no cost with the respirator to be used on the above project.

TRAINING COURSE: You must have been trained in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures and personal and area protective measures. The topics covered in the course must have included the following:

- Physical characteristics of asbestos
- Health hazards associated with asbestos
- Respiratory protection
- Use of protective equipment
- Pressure Differential Systems
- Work practices including hands-on or on-job training
- Personal decontamination procedures
- Air monitoring, personal and area

MEDICAL EXAMINATION: You must have had a medical examination within 12 months at no cost to you. The examination must have included: Health history, pulmonary function tests, and may have included an evaluation of a chest x-ray.

By signing this document you are acknowledging only that the Owner of the building you are about to work in has advised you of your rights to training and protection relative to your employer, the Contractor.

SIGNATURE_____

SOCIAL SECURITY No.: XXX-XX-_____

PRINT NAME: _____

WITNESS: _____

SECTION 01 80 00

SITE CLEAN UP AND POST-PROJECT SUBMITTALS

PART 1 - GENERAL

1.01 DAMAGE REPAIR

A. Any damage to surfaces and/or building components, other than those designated for demolition, caused by the Contractor's activity or his workers, shall be repaired or replaced at no additional cost to the Owner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 FINAL CONSTRUCTION SITE CLEAN UP

A. Work of this section shall be performed once the Contractor has successfully passed all required final visual inspections of the regulated areas, and all asbestos-containing waste has been properly removed from the work site.

B. Prior to the Owner’s Representative's final inspection, the Contractor shall remove from within and around the building all debris, waste, trash, etc., generated by the Contractor's workers.

3.02 FINAL INSPECTION

A. The Owner's Representative shall set a date for the final inspection when a notice of readiness for final inspection is received from the Contractor. During this inspection the Owner's Representative shall make a written list of deficiencies.

B. When all deficient items have been corrected and accepted by the Owner's Representative, the Contractor may submit his application for payment.

3.03 SUBMITTAL DOCUMENTS

A. Four (4) copies of the following documents shall be submitted to the Owner via the Consultant prior to the start of work:

1. Copy of an approved notification for demolition and/or renovation from governing agency giving dates when removal will begin and be completed

2. Copy of the letter of order from a government official or professional engineer that the structure be removed as RACM (This can be obtained from the Architect at no cost to the Contractor.)

3. Proof of insurance naming the Owner and Consultant as additional certificate holders

4. Copy of State of Georgia Asbestos Contractor's license

5. Copy of the asbestos supervisor(s) accreditation

6. Proof of asbestos worker training within the last 12 months for each employee involved in the project

7. Medical examination report for each employee of the Contractor who was involved in the project

8. Respirator training for each employee of the Contractor who was involved in the project

3.04 POST SUBMITTAL DOCUMENTS

A. Four (4) copies of the following documents shall be submitted to the Owner via the Consultant at the completion of the work:

1. "Worker Release Form" for each employee of the Contractor who was involved in the project

2. Safety Data Sheets for all hazardous chemicals incorporated in the work

3. Regulated area sign in/sign out sheets and daily logs maintained by the Contractor's asbestos abatement supervisor

4. Certificate of Visual Inspection for each regulated area signed by the Contractor and a representative of the Owner

5. Waste Shipment Records and Chain of Custody Forms for asbestos and lead waste

B. Pre- and Post-submittals shall be bound in three-ring binders with each section tabbed or separated by a colored sheet of paper and cross-referenced to an index. The cover shall be labeled with the project name and inclusive dates. The required submittals shall be forwarded to the Owner via the Consultant.

END OF SECTION

ADD ALTERNATE #4

CERTIFICATE OF WORKERS ACKNOWLEDGEMENT-ASBESTOS

PROJECT NAME: _____

PROJECT ADDRESS: _____

CONTRACTOR'S NAME: _____

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBERS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCER. IF YOU SMOKE AND INHALE ASBESTOS FIBERS THE CHANCE THAT YOU WILL DEVELOP LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.

Your employer's contract with the Owner for the above project requires that: You be supplied with the proper respirator and be trained in its use. You will be trained in safe work practices and in the use of the equipment found on the job. You will receive a medical examination. These things are to have been done at no cost to you.

RESPIRATORY PROTECTION: You must have been trained in the proper use of respirators, and informed of the type or respirator to be used on the above referenced project. You must be given a copy of the written respiratory protection manual issued by your employer. You must be equipped at no cost with the respirator to be used on the above project.

TRAINING COURSE: You must have been trained in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures and personal and area protective measures. The topics covered in the course must have included the following:

- Physical characteristics of asbestos
- Health hazards associated with asbestos
- Respiratory protection
- Use of protective equipment
- Pressure Differential Systems
- Work practices including hands-on or on-job training
- Personal decontamination procedures
- Air monitoring, personal and area

MEDICAL EXAMINATION: You must have had a medical examination within 12 months at no cost to you. The examination must have included: Health history, pulmonary function tests, and may have included an evaluation of a chest x-ray.

By signing this document you are acknowledging only that the Owner of the building you are about to work in has advised you of your rights to training and protection relative to your employer, the Contractor.

SIGNATURE_____

SOCIAL SECURITY No.: XXX-XX-_____

PRINT NAME: _____

WITNESS: _____

DIVISION 2 - SITE WORK

SECTION 02 08 10 - REMOVAL OF ASBESTOS CONTAINING MATERIAL

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. The scope of work generally consists of the removal and disposal of friable and non-friable asbestos-containing materials located in Building #99 on the campus of East Central Regional Hospital in Gracewood, Georgia. The following is a brief summary of the materials to be abated (any quantities provided are only estimates and shall not be used for bidding purposes):

1. Remove and dispose of approximately 150 square feet of ACM 12”x12” floor tile and associated mastic.

B. In addition to the material shown on the drawings, all construction debris and trash generated by the abatement of asbestos-containing materials shall be removed from the area on a daily basis and disposed as asbestos-containing waste.

1.02 MEDICAL REQUIREMENTS

A. Medical Examinations Before exposure to airborne asbestos fibers, the contractor will provide workers with a comprehensive medical examination as required by 29 CFR 1926.1101. This examination consists of a pulmonary function test and a chest x-ray at the discretion of the physician performing the physical. The same examination is required on an annual basis for all employees engaged in an occupation involving asbestos fibers.

B. Medical Records The contractor shall establish and maintain accurate medical surveillance records for each employee subject to medical surveillance by 29 CFR 1926.1101 and shall maintain the records for the duration of employment plus 30 years in accordance with 29 CFR 1910.20.

1.03 TRAINING CERTIFICATION AND PROJECT SUPERVISION

A. Supervisor A supervisor shall be present at all times asbestos abatement is in progress. The supervisor shall have completed a course at an EPA approved training center, or equivalent certificate course, in asbestos abatement procedures and be licensed by the Georgia Department of Natural Resources Environmental Protection Division. The supervisor shall have had a minimum of two years’ on-the-job experience in asbestos abatement procedures and shall be a competent person as described in 29 CFR 1926.1101.

B. Worker Training Prior to assignment to this asbestos work project, the contractor shall provide instruction to each employee with regard to the hazards of asbestos safety and health precautions and the use and requirements of protective clothing and equipment including respirators. This instruction shall fully cover engineering and other hazard control techniques and procedures and shall conform to training required by 40 CFR Part 763, Subpart E.

1.04 PERMITS, LICENSES AND NOTIFICATIONS

A. The contractor shall secure the necessary permits in conjunction with asbestos removal, hauling and disposal. Timely notification of such actions as may be required by Federal, State or Local authorities shall be made. Ten days notification prior to the start of work shall be required to secure a work permit from the Georgia Environmental Protection Division and a copy of this permit shall be submitted to the Owner prior to the start of this work. A copy of the permit shall be posted at the job site at all times.

1.05 RESPIRATORY PROTECTION PROGRAM

A. The Contractor shall have a written respiratory protection program that governs the selection, use, maintenance, and care of respirators. Workers shall be provided respirators approved by the National

Institute for Occupational Safety & Health (NIOSH). The respirators will be used in accordance with Occupational Safety and Health Administration (OSHA) standards.

B. All respirators must be fitted with a HEPA filter designated by NIOSH for asbestos fiber protection (N, R or P-100).

1.06 CONTINGENCY PLAN

A. Contractor shall prepare a contingency plan for emergencies including fire, accident, power failure, pressure differential system failure, supplied air system failures, or other events that may require modification or abridgment of decontamination or work area isolation procedures.

B. Note that nothing in this abatement specification should impede safe exiting or providing adequate medical attention in the event of an emergency.

1.07 MECHANICAL AND ELECTRICAL SYSTEMS

A. The Contractor shall take note where mechanical and/or electrical hazards are located and take necessary precautions in these areas.

1.08 COMPLIANCE WITH OSHA STANDARDS

A. It is the intent of this section for the contractor to comply fully with all Federal, State and Local regulations and codes regarding removal and disposal of asbestos-containing materials. Nothing in this section should be interpreted to conflict with this intent. The Contractor is responsible to ensure worker safety complies with Occupational Safety and Health Administration (OSHA) safety requirements. Hard hats, eye goggles, gloves, safety belts, etc., shall be worn when work tasks require this additional safety protection.

B. No attempt has been made to specify all applicable Federal and/or State requirements dealing with worker safety or public safety within the confines of these specifications. This should not be construed as an abridgment of these requirements. As is always the case, the contractor has the responsibility to determine which non-specified requirements apply to his work and the responsibility to initiate steps to comply with these non-specified requirements on an as needed or required basis.

PART 2 - PRODUCTS

2.01 WETTING AGENTS AND ENCAPSULANTS

A. Surfactant: Provide water to which a surfactant has been added. Use a mixture of surfactant and water that results in wetting of the asbestos containing material and retardation of fiber release during disturbance.

B. Encapsulant: Provide an encapsulant designed specifically to lock down asbestos fibers during and following asbestos abatement. Use in strict compliance with manufacturer's instructions.

2.02 POLYETHYLENE PLASTIC SHEETING

A. Polyethylene plastic sheeting in the largest sheet size possible to minimize seams shall be available, 4-mil and 6-mil thickness, clear, frosted and/or black, as required.

B. Provide reinforced polyethylene plastic sheeting in the largest sheet size possible to minimize seams, 6-mil thickness, clear, frosted or black.

C. Polyethylene plastic sheeting shall be flame resistant and conform to the National Fire Protection Association Standard 701, "Small-Scale Fire Test for Flame-Resistant Textiles and Films."

2.03 ADHESIVES

A. Provide duct tape at least 1.5 inches wide with an adhesive formulated to stick aggressively to polyethylene plastic sheeting.

B. Provide spray adhesive formulated to stick aggressively to polyethylene plastic sheeting.

2.04 DISPOSAL BAGS

A. Provide 6-mil thick, leak-tight polyethylene plastic bags labeled in accordance with Paragraph k (7) (iii), 29 CFR 1926.1101.

2.05 HIGH EFFICIENCY PARTICULATE ABSOLUTE (HEPA) FILTERS

A. Provide vacuum cleaner, air filtration machine, and respirators with a HEPA filter capable of filtering particles of 0.3 microns or greater at 99.97% efficiency.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Personal Protection

1. Respirators: Provide respirators that are the most comfortable and afford the best seal and protection. Cartridge filters shall be approved for respiratory protection against fumes, dusts, and mists having a permissible exposure limit of less than 0.05 milligrams per cubic meter (a HEPA filter). At a minimum, workers shall be provided half-face, negative pressure respirators equipped with a HEPA filter. A clean set of cartridge filters shall be provided to workers upon each entry into the regulated area. All individuals entering the asbestos regulated area after the commencement of asbestos removal work shall be required to wear respiratory protection.

2. Protective Clothing: A sufficient number of disposable full body coveralls shall be available to provide each worker a clean suit upon each entry into the regulated area.

B. Ground Fault Protection

1. Equip all circuits for any purpose entering the regulated area with ground fault circuit interrupters (GFCI). Locate GFCIs outside the regulated area so that all circuits are protected prior to entry into the regulated area. Provide circuit breaker type GFCI equipped with test button and reset switches for all circuits to be used for any purpose in the regulated area, decontamination unit, exterior, or as otherwise required by National Electrical Code, OSHA or other authority. Locate the panel exterior to the regulated area.

2. Use only grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Use single lengths or use waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas of work.

C. Signs and Labels

1. Warning signs shall be displayed at the entrance to the regulated area. Signs shall be posted at such a distance from the regulated area that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. The warning signs shall bear the following information:

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA
AUTHORIZED PERSONNEL ONLY

2. Labels shall be affixed to all waste bags or waste wrapped in polyethylene plastic. Labels shall be printed in large, bold letters on a contrasting background and used in accordance with the requirements of 29 CFR 1910.1200(f) of OSHA's Hazard Communication standard, and shall contain the following information:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNHGS
DO NOT BREATHE DUST
AVOID CREATING DUST

3.02 AIR CIRCULATION AND FILTRATION SYSTEM

A. Diminished pressure inside the regulated area shall be maintained 24 hours per day for the duration of the project. Duration shall be considered from the time critical barriers are installed through the time acceptable final air clearance results are obtained.

B. A high efficiency particulate absolute (HEPA) filtration system shall be used. The HEPA system shall be capable of collecting and retaining 99.97 per cent of airborne particles with an aerodynamic diameter of .3 microns or larger.

C. Diminished pressure inside the regulated area shall be maintained with the use of HEPA filtered machines, shall be designed to move air away from the worker's breathing zone, shall exhaust directly to the exterior of the building, and shall have the capacity to produce at a minimum four air changes per hour.

3.03 INSTALLATION OF CRITICAL BARRIERS

A. Enclose the work area by installing critical barriers over all windows, doorways, drains, ducts, grills, grates, diffusers, skylights, etc. Critical barriers shall consist of at least 4-mil thick polyethylene plastic sheeting secured in place with duct tape and/or spray adhesive.

B. The Contractor shall decontaminate and remove all movable objects from the regulated area and dispose as construction debris. Non-movable objects remaining in the regulated area shall be wet cleaned and HEPA vacuumed and covered with at least one layer of 4-mil polyethylene plastic sheeting secured in place with duct tape and/or spray adhesive.

C. During removal of windows with windowpane glaze intact, install a single layer of 4-mil polyethylene plastic sheeting over the window opening from the interior of the building. Secure plastic sheeting in place using duct tape and/or spray adhesive.

3.04 STOP WORK

A. If critical barriers fail or are breached in any manner, stop work immediately. Do not start work until the situation has been corrected and written authorization obtained from the Owner's Representative.

3.05 REMOVAL OF ACM FLOOR COVERINGS AND MASTICS

A. The use of destructive methods to remove asbestos-containing floor coverings and mastics that render these materials friable is discouraged. If floor covering is broken during removal, it shall be considered friable removal and shall be subject to all the notification requirements, procedures and practices of friable removal as required by EPA NESHAP and OSHA. The following are three alternate methods for removing floor coverings and mastic that aid in this objective. One or a combination of each may be successfully used.

1. Sufficiently wet the floor covering with an amended water/foam solution. Allow ample time for the amended water to penetrate to the mastic.

2. Dry ice may be used in well-ventilated areas only to allow the material to contract and break loose from the substrate. Before using dry ice, permission must be obtained from the Designer.

3. Heat from an infrared gun may soften the mastic enough so that material can be pulled up easily. The use of heat guns is limited to electric-powered flameless guns operating below 1,100 degrees Fahrenheit. If the material is heated and can be removed intact, wetting may be omitted. The floor coverings must still be wet when placed in disposal bags. Heat guns may not be used on wood flooring. Under OSHA regulation 29 CFR 1926.150, a fully charged ABC-type 20-pound (minimum) fire extinguisher must be available within 100 feet of work utilizing a heat gun. When using the heat gun, an organic filter must be used in conjunction with the HEPA filter.

B. Once the floor covering is removed, and while still wet, place the material in a 6-mil leak-tight disposal bag and then into a second pre-labeled disposal bag. Seal the disposal bag with three wraps of duct tape. Move disposal bags to the washroom of the equipment decontamination unit.

C. Remove remaining mastic with an approved solvent or cleaner. Petroleum based solvents shall not be used. Scraping of residual mastic shall be performed using wet methods.

D. All waste materials, including mops and cleaning rags used to remove mastic, shall be disposed of as contaminated waste.

END OF SECTION

DIVISION 2 - SITE WORK

SECTION 02 08 10 - REMOVAL OF ASBESTOS CONTAINING MATERIAL

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. The scope of work generally consists of the removal and disposal of friable and non-friable asbestos-containing materials located in Building #100 on the campus of East Central Regional Hospital in Gracewood, Georgia. The following is a brief summary of the materials to be abated (any quantities provided are only estimates and shall not be used for bidding purposes):

1. Remove and dispose of approximately 60 square feet of cementitious panels as friable ACM
2. Remove and dispose of rope packing as friable ACM
3. Remove and dispose of black mastic as non-friable ACM
4. Remove and dispose of approximately 6,914 square feet of sheet vinyl flooring as friable ACM
5. Remove and dispose of approximately 100 square feet of cementitious ceiling tiles as Presumed Asbestos-Containing Material (PACM)

B. In addition to the material shown on the drawings, all construction debris and trash generated by the abatement of asbestos-containing materials shall be removed from the area on a daily basis and disposed as asbestos-containing waste.

1.02 MEDICAL REQUIREMENTS

A. Medical Examinations Before exposure to airborne asbestos fibers, the contractor will provide workers with a comprehensive medical examination as required by 29 CFR 1926.1101. This examination consists of a pulmonary function test and a chest x-ray at the discretion of the physician performing the physical. The same examination is required on an annual basis for all employees engaged in an occupation involving asbestos fibers.

B. Medical Records The contractor shall establish and maintain accurate medical surveillance records for each employee subject to medical surveillance by 29 CFR 1926.1101 and shall maintain the records for the duration of employment plus 30 years in accordance with 29 CFR 1910.20.

1.03 TRAINING CERTIFICATION AND PROJECT SUPERVISION

A. Supervisor A supervisor shall be present at all times asbestos abatement is in progress. The supervisor shall have completed a course at an EPA approved training center, or equivalent certificate course, in asbestos abatement procedures and be licensed by the Georgia Department of Natural Resources Environmental Protection Division. The supervisor shall have had a minimum of two years' on-the-job experience in asbestos abatement procedures and shall be a competent person as described in 29 CFR 1926.1101.

B. Worker Training Prior to assignment to this asbestos work project, the contractor shall provide instruction to each employee with regard to the hazards of asbestos safety and health precautions and the use and requirements of protective clothing and equipment including respirators. This instruction shall fully cover engineering and other hazard control techniques and procedures and shall conform to training required by 40 CFR Part 763, Subpart E.

1.04 PERMITS, LICENSES AND NOTIFICATIONS

A. The contractor shall secure the necessary permits in conjunction with asbestos removal, hauling and disposal. Timely notification of such actions as may be required by Federal, State or Local authorities shall be made. Ten days notification prior to the start of work shall be required to secure a work permit from the Georgia Environmental Protection Division and a copy of this permit shall be submitted to the Owner prior to the start of this work. A copy of the permit shall be posted at the job site at all times.

1.05 RESPIRATORY PROTECTION PROGRAM

A. The Contractor shall have a written respiratory protection program that governs the selection, use, maintenance, and care of respirators. Workers shall be provided respirators approved by the National Institute for Occupational Safety & Health (NIOSH). The respirators will be used in accordance with Occupational Safety and Health Administration (OSHA) standards.

B. All respirators must be fitted with a HEPA filter designated by NIOSH for asbestos fiber protection (N, R or P-100).

1.06 CONTINGENCY PLAN

A. Contractor shall prepare a contingency plan for emergencies including fire, accident, power failure, pressure differential system failure, supplied air system failures, or other events that may require modification or abridgment of decontamination or work area isolation procedures.

B. Note that nothing in this abatement specification should impede safe exiting or providing adequate medical attention in the event of an emergency.

1.07 MECHANICAL AND ELECTRICAL SYSTEMS

A. The Contractor shall take note where mechanical and/or electrical hazards are located and take necessary precautions in these areas.

1.08 COMPLIANCE WITH OSHA STANDARDS

A. It is the intent of this section for the contractor to comply fully with all Federal, State and Local regulations and codes regarding removal and disposal of asbestos-containing materials. Nothing in this section should be interpreted to conflict with this intent. The Contractor is responsible to ensure worker safety complies with Occupational Safety and Health Administration (OSHA) safety requirements. Hard hats, eye goggles, gloves, safety belts, etc., shall be worn when work tasks require this additional safety protection.

B. No attempt has been made to specify all applicable Federal and/or State requirements dealing with worker safety or public safety within the confines of these specifications. This should not be construed as an abridgment of these requirements. As is always the case, the contractor has the responsibility to determine which non-specified requirements apply to his work and the responsibility to initiate steps to comply with these non-specified requirements on an as needed or required basis.

PART 2 - PRODUCTS

2.01 WETTING AGENTS AND ENCAPSULANTS

A. Surfactant: Provide water to which a surfactant has been added. Use a mixture of surfactant and water that results in wetting of the asbestos containing material and retardation of fiber release during disturbance.

B. Encapsulant: Provide an encapsulant designed specifically to lock down asbestos fibers during and following asbestos abatement. Use in strict compliance with manufacturer's instructions.

2.02 POLYETHYLENE PLASTIC SHEETING

A. Polyethylene plastic sheeting in the largest sheet size possible to minimize seams shall be available, 4-mil and 6-mil thickness, clear, frosted and/or black, as required.

B. Provide reinforced polyethylene plastic sheeting in the largest sheet size possible to minimize seams, 6-mil thickness, clear, frosted or black.

C. Polyethylene plastic sheeting shall be flame resistant and conform to the National Fire Protection Association Standard 701, "Small-Scale Fire Test for Flame-Resistant Textiles and Films."

2.03 ADHESIVES

A. Provide duct tape at least 1.5 inches wide with an adhesive formulated to stick aggressively to polyethylene plastic sheeting.

B. Provide spray adhesive formulated to stick aggressively to polyethylene plastic sheeting.

2.04 DISPOSAL BAGS

A. Provide 6-mil thick, leak-tight polyethylene plastic bags labeled in accordance with Paragraph k (7) (iii), 29 CFR 1926.1101.

2.05 HIGH EFFICIENCY PARTICULATE ABSOLUTE (HEPA) FILTERS

A. Provide vacuum cleaner, air filtration machine, and respirators with a HEPA filter capable of filtering particles of 0.3 microns or greater at 99.97% efficiency.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Personal Protection

1. Respirators: Provide respirators that are the most comfortable and afford the best seal and protection. Cartridge filters shall be approved for respiratory protection against fumes, dusts, and mists having a permissible exposure limit of less than 0.05 milligrams per cubic meter (a HEPA filter). At a minimum, workers shall be provided half-face, negative pressure respirators equipped with a HEPA filter. A clean set of cartridge filters shall be provided to workers upon each entry into the regulated area. All individuals entering the asbestos regulated area after the commencement of asbestos removal work shall be required to wear respiratory protection.

2. Protective Clothing: A sufficient number of disposable full body coveralls shall be available to provide each worker a clean suit upon each entry into the regulated area.

B. Ground Fault Protection

1. Equip all circuits for any purpose entering the regulated area with ground fault circuit interrupters (GFCI). Locate GFCIs outside the regulated area so that all circuits are protected prior to entry into the regulated area. Provide circuit breaker type GFCI equipped with test button and reset switches for all circuits to be used for any purpose in the regulated area, decontamination unit, exterior, or as otherwise required by National Electrical Code, OSHA or other authority. Locate the panel exterior to the regulated area.

2. Use only grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Use single lengths or use waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas of work.

C. Signs and Labels

1. Warning signs shall be displayed at the entrance to the regulated area. Signs shall be posted at such a distance from the regulated area that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. The warning signs shall bear the following information:

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA
AUTHORIZED PERSONNEL ONLY

2. Labels shall be affixed to all waste bags or waste wrapped in polyethylene plastic. Labels shall be printed in large, bold letters on a contrasting background and used in accordance with the requirements of 29 CFR 1910.1200(f) of OSHA's Hazard Communication standard, and shall contain the following information:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNHGS
DO NOT BREATHE DUST
AVOID CREATING DUST

3.02 AIR CIRCULATION AND FILTRATION SYSTEM

A. Diminished pressure inside the regulated area shall be maintained 24 hours per day for the duration of the project. Duration shall be considered from the time critical barriers are installed through the time acceptable final air clearance results are obtained.

B. A high efficiency particulate absolute (HEPA) filtration system shall be used. The HEPA system shall be capable of collecting and retaining 99.97 per cent of airborne particles with an aerodynamic diameter of .3 microns or larger.

C. Diminished pressure inside the regulated area shall be maintained with the use of HEPA filtered machines, shall be designed to move air away from the worker's breathing zone, shall exhaust directly to the exterior of the building, and shall have the capacity to produce at a minimum four air changes per hour.

3.03 INSTALLATION OF CRITICAL BARRIERS

A. Enclose the work area by installing critical barriers over all windows, doorways, drains, ducts, grills, grates, diffusers, skylights, etc. Critical barriers shall consist of at least 4-mil thick polyethylene plastic sheeting secured in place with duct tape and/or spray adhesive.

B. The Contractor shall decontaminate and remove all movable objects from the regulated area and dispose as construction debris. Non-movable objects remaining in the regulated area shall be wet cleaned and HEPA vacuumed and covered with at least one layer of 4-mil polyethylene plastic sheeting secured in place with duct tape and/or spray adhesive.

C. During removal of windows with windowpane glaze intact, install a single layer of 4-mil polyethylene plastic sheeting over the window opening from the interior of the building. Secure plastic sheeting in place using duct tape and/or spray adhesive.

3.04 STOP WORK

A. If critical barriers fail or are breached in any manner, stop work immediately. Do not start work until the situation has been corrected and written authorization obtained from the Owner's Representative.

3.05 REMOVAL OF ACM FLOOR COVERINGS AND MASTICS

A. The use of destructive methods to remove asbestos-containing floor coverings and mastics that render these materials friable is discouraged. If floor covering is broken during removal, it shall be considered friable removal and shall be subject to all the notification requirements, procedures and practices of friable removal as required by EPA NESHAP and OSHA. The following are three alternate methods for removing floor coverings and mastic that aid in this objective. One or a combination of each may be successfully used.

1. Sufficiently wet the floor covering with an amended water/foam solution. Allow ample time for the amended water to penetrate to the mastic.

2. Dry ice may be used in well-ventilated areas only to allow the material to contract and break loose from the substrate. Before using dry ice, permission must be obtained from the Designer.

3. Heat from an infrared gun may soften the mastic enough so that material can be pulled up easily. The use of heat guns is limited to electric-powered flameless guns operating below 1,100 degrees Fahrenheit. If the material is heated and can be removed intact, wetting may be omitted. The floor coverings must still be wet when placed in disposal bags. Heat guns may not be used on wood flooring. Under OSHA regulation 29 CFR 1926.150, a fully charged ABC-type 20-pound (minimum) fire extinguisher must be available within 100 feet of work utilizing a heat gun. When using the heat gun, an organic filter must be used in conjunction with the HEPA filter.

B. Once the floor covering is removed, and while still wet, place the material in a 6-mil leak-tight disposal bag and then into a second pre-labeled disposal bag. Seal the disposal bag with three wraps of duct tape. Move disposal bags to the washroom of the equipment decontamination unit.

C. Remove remaining mastic with an approved solvent or cleaner. Petroleum based solvents shall not be used. Scraping of residual mastic shall be performed using wet methods.

D. All waste materials, including mops and cleaning rags used to remove mastic, shall be disposed of as contaminated waste.

3.06 REMOVAL OF ACM ROPE PACKING

A. Rope packings where pipes penetrate walls shall be removed using wet methods.

B. Wet packing with a fine mist of amended water or removal encapsulant. Allow time for amended water to saturate material. Do not over saturate to cause dripping. Remove material in manageable quantities.

C. If using amended water, mist surface continuously during work process. If using removal encapsulant, follow manufacturer's instructions.

D. Place material in pre-labeled disposal bags while still wet. Do not permit large quantities of material to collect before bagging, and do not allow material to dry.

3.07 REMOVAL OF ACM BLACK MASTIC ON FOAM ROCK INSULATION

A. The abatement of black mastic at the seams of foam rock steam line insulation can be accomplished by removing sections of the insulation which contain this material for proper disposal as ACM. Place material in pre-labeled disposal bags.

3.08 REMOVAL OF ASBESTOS CEMENTITIOUS PANELS

A. Asbestos cement panels (often manufactured as Transite®) shall be removed from the building. This material shall be removed intact as much as practical. If broken for removal purposes, this shall be removed as friable asbestos-containing material.

B. The asbestos cement board shall be adequately wet prior to disturbance. The material shall be removed in complete pieces as installed if possible.

C. Scraping and/or use of a stiff bristle brush may be used to accomplish clean-up when the panel is removed. Wire brushes and pressure washers are not to be used.

D. When removal is accomplished on the inside of the building, diminished pressure shall be maintained at all times until final inspection and approval of the work area by the consultant. If removal is accomplished on the exterior of the building, drop cloth, barriers, caution tape and proper signage shall be utilized to prevent contamination of any surrounding areas and to establish a regulated area.

END OF SECTION

DIVISION 2 - SITE WORK

SECTION 02 08 10 - REMOVAL OF ASBESTOS CONTAINING MATERIAL

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. The scope of work generally consists of the removal and disposal of friable and non-friable asbestos-containing materials located in Building #101 on the campus of East Central Regional Hospital in Gracewood, Georgia. The following is a brief summary of the materials to be abated (any quantities provided are only estimates and shall not be used for bidding purposes):

1. Remove and dispose of black mastic as non-friable ACM
2. Remove and dispose of approximately 6,914 square feet of sheet vinyl flooring as friable ACM
3. Remove and dispose of approximately 450 square feet of cementitious ceiling tiles as Presumed Asbestos-Containing Material (PACM)

B. In addition to the material shown on the drawings, all construction debris and trash generated by the abatement of asbestos-containing materials shall be removed from the area on a daily basis and disposed as asbestos-containing waste.

1.02 MEDICAL REQUIREMENTS

A. Medical Examinations Before exposure to airborne asbestos fibers, the contractor will provide workers with a comprehensive medical examination as required by 29 CFR 1926.1101. This examination consists of a pulmonary function test and a chest x-ray at the discretion of the physician performing the physical. The same examination is required on an annual basis for all employees engaged in an occupation involving asbestos fibers.

B. Medical Records The contractor shall establish and maintain accurate medical surveillance records for each employee subject to medical surveillance by 29 CFR 1926.1101 and shall maintain the records for the duration of employment plus 30 years in accordance with 29 CFR 1910.20.

1.03 TRAINING CERTIFICATION AND PROJECT SUPERVISION

A. Supervisor A supervisor shall be present at all times asbestos abatement is in progress. The supervisor shall have completed a course at an EPA approved training center, or equivalent certificate course, in asbestos abatement procedures and be licensed by the Georgia Department of Natural Resources Environmental Protection Division. The supervisor shall have had a minimum of two years' on-the-job experience in asbestos abatement procedures and shall be a competent person as described in 29 CFR 1926.1101.

B. Worker Training Prior to assignment to this asbestos work project, the contractor shall provide instruction to each employee with regard to the hazards of asbestos safety and health precautions and the use and requirements of protective clothing and equipment including respirators. This instruction shall fully cover engineering and other hazard control techniques and procedures and shall conform to training required by 40 CFR Part 763, Subpart E.

1.04 PERMITS, LICENSES AND NOTIFICATIONS

A. The contractor shall secure the necessary permits in conjunction with asbestos removal, hauling and disposal. Timely notification of such actions as may be required by Federal, State or Local authorities shall be made. Ten days notification prior to the start of work shall be required to secure a work permit from the Georgia Environmental Protection Division and a copy of this permit shall be submitted to the Owner prior to the start of this work. A copy of the permit shall be posted at the job site at all times.

1.05 RESPIRATORY PROTECTION PROGRAM

A. The Contractor shall have a written respiratory protection program that governs the selection, use, maintenance, and care of respirators. Workers shall be provided respirators approved by the National Institute for Occupational Safety & Health (NIOSH). The respirators will be used in accordance with Occupational Safety and Health Administration (OSHA) standards.

B. All respirators must be fitted with a HEPA filter designated by NIOSH for asbestos fiber protection (N, R or P-100).

1.06 CONTINGENCY PLAN

A. Contractor shall prepare a contingency plan for emergencies including fire, accident, power failure, pressure differential system failure, supplied air system failures, or other events that may require modification or abridgment of decontamination or work area isolation procedures.

B. Note that nothing in this abatement specification should impede safe exiting or providing adequate medical attention in the event of an emergency.

1.07 MECHANICAL AND ELECTRICAL SYSTEMS

A. The Contractor shall take note where mechanical and/or electrical hazards are located and take necessary precautions in these areas.

1.08 COMPLIANCE WITH OSHA STANDARDS

A. It is the intent of this section for the contractor to comply fully with all Federal, State and Local regulations and codes regarding removal and disposal of asbestos-containing materials. Nothing in this section should be interpreted to conflict with this intent. The Contractor is responsible to ensure worker safety complies with Occupational Safety and Health Administration (OSHA) safety requirements. Hard hats, eye goggles, gloves, safety belts, etc., shall be worn when work tasks require this additional safety protection.

B. No attempt has been made to specify all applicable Federal and/or State requirements dealing with worker safety or public safety within the confines of these specifications. This should not be construed as an abridgment of these requirements. As is always the case, the contractor has the responsibility to determine which non-specified requirements apply to his work and the responsibility to initiate steps to comply with these non-specified requirements on an as needed or required basis.

PART 2 - PRODUCTS

2.01 WETTING AGENTS AND ENCAPSULANTS

A. Surfactant: Provide water to which a surfactant has been added. Use a mixture of surfactant and water that results in wetting of the asbestos containing material and retardation of fiber release during disturbance.

B. Encapsulant: Provide an encapsulant designed specifically to lock down asbestos fibers during and following asbestos abatement. Use in strict compliance with manufacturer's instructions.

2.02 POLYETHYLENE PLASTIC SHEETING

A. Polyethylene plastic sheeting in the largest sheet size possible to minimize seams shall be available, 4-mil and 6-mil thickness, clear, frosted and/or black, as required.

B. Provide reinforced polyethylene plastic sheeting in the largest sheet size possible to minimize seams, 6-mil thickness, clear, frosted or black.

C. Polyethylene plastic sheeting shall be flame resistant and conform to the National Fire Protection Association Standard 701, "Small-Scale Fire Test for Flame-Resistant Textiles and Films."

2.03 ADHESIVES

A. Provide duct tape at least 1.5 inches wide with an adhesive formulated to stick aggressively to polyethylene plastic sheeting.

B. Provide spray adhesive formulated to stick aggressively to polyethylene plastic sheeting.

2.04 DISPOSAL BAGS

A. Provide 6-mil thick, leak-tight polyethylene plastic bags labeled in accordance with Paragraph k (7) (iii), 29 CFR 1926.1101.

2.05 HIGH EFFICIENCY PARTICULATE ABSOLUTE (HEPA) FILTERS

A. Provide vacuum cleaner, air filtration machine, and respirators with a HEPA filter capable of filtering particles of 0.3 microns or greater at 99.97% efficiency.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Personal Protection

1. Respirators: Provide respirators that are the most comfortable and afford the best seal and protection. Cartridge filters shall be approved for respiratory protection against fumes, dusts, and mists having a permissible exposure limit of less than 0.05 milligrams per cubic meter (a HEPA filter). At a minimum, workers shall be provided half-face, negative pressure respirators equipped with a HEPA filter. A clean set of cartridge filters shall be provided to workers upon each entry into the regulated area. All individuals entering the asbestos regulated area after the commencement of asbestos removal work shall be required to wear respiratory protection.

2. Protective Clothing: A sufficient number of disposable full body coveralls shall be available to provide each worker a clean suit upon each entry into the regulated area.

B. Ground Fault Protection

1. Equip all circuits for any purpose entering the regulated area with ground fault circuit interrupters (GFCI). Locate GFCIs outside the regulated area so that all circuits are protected prior to entry into the regulated area. Provide circuit breaker type GFCI equipped with test button and reset switches for all circuits to be used for any purpose in the regulated area, decontamination unit, exterior, or as otherwise required by National Electrical Code, OSHA or other authority. Locate the panel exterior to the regulated area.

2. Use only grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Use single lengths or use waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas of work.

C. Signs and Labels

1. Warning signs shall be displayed at the entrance to the regulated area. Signs shall be posted at such a distance from the regulated area that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. The warning signs shall bear the following information:

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA
AUTHORIZED PERSONNEL ONLY

2. Labels shall be affixed to all waste bags or waste wrapped in polyethylene plastic. Labels shall be printed in large, bold letters on a contrasting background and used in accordance with the requirements of 29 CFR 1910.1200(f) of OSHA's Hazard Communication standard, and shall contain the following information:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNHGS
DO NOT BREATHE DUST
AVOID CREATING DUST

3.02 AIR CIRCULATION AND FILTRATION SYSTEM

A. Diminished pressure inside the regulated area shall be maintained 24 hours per day for the duration of the project. Duration shall be considered from the time critical barriers are installed through the time acceptable final air clearance results are obtained.

B. A high efficiency particulate absolute (HEPA) filtration system shall be used. The HEPA system shall be capable of collecting and retaining 99.97 per cent of airborne particles with an aerodynamic diameter of .3 microns or larger.

C. Diminished pressure inside the regulated area shall be maintained with the use of HEPA filtered machines, shall be designed to move air away from the worker's breathing zone, shall exhaust directly to the exterior of the building, and shall have the capacity to produce at a minimum four air changes per hour.

3.03 INSTALLATION OF CRITICAL BARRIERS

A. Enclose the work area by installing critical barriers over all windows, doorways, drains, ducts, grills, grates, diffusers, skylights, etc. Critical barriers shall consist of at least 4-mil thick polyethylene plastic sheeting secured in place with duct tape and/or spray adhesive.

B. The Contractor shall decontaminate and remove all movable objects from the regulated area and dispose as construction debris. Non-movable objects remaining in the regulated area shall be wet cleaned and HEPA vacuumed and covered with at least one layer of 4-mil polyethylene plastic sheeting secured in place with duct tape and/or spray adhesive.

C. During removal of windows with windowpane glaze intact, install a single layer of 4-mil polyethylene plastic sheeting over the window opening from the interior of the building. Secure plastic sheeting in place using duct tape and/or spray adhesive.

3.04 STOP WORK

A. If critical barriers fail or are breached in any manner, stop work immediately. Do not start work until the situation has been corrected and written authorization obtained from the Owner's Representative.

3.05 REMOVAL OF ACM FLOOR COVERINGS AND MASTICS

A. The use of destructive methods to remove asbestos-containing floor coverings and mastics that render these materials friable is discouraged. If floor covering is broken during removal, it shall be considered friable removal and shall be subject to all the notification requirements, procedures and practices of friable removal as required by EPA NESHAP and OSHA. The following are three alternate methods for removing floor coverings and mastic that aid in this objective. One or a combination of each may be successfully used.

1. Sufficiently wet the floor covering with an amended water/foam solution. Allow ample time for the amended water to penetrate to the mastic.

2. Dry ice may be used in well-ventilated areas only to allow the material to contract and break loose from the substrate. Before using dry ice, permission must be obtained from the Designer.

3. Heat from an infrared gun may soften the mastic enough so that material can be pulled up easily. The use of heat guns is limited to electric-powered flameless guns operating below 1,100 degrees Fahrenheit. If the material is heated and can be removed intact, wetting may be omitted. The floor coverings must still be wet when placed in disposal bags. Heat guns may not be used on wood flooring. Under OSHA regulation 29 CFR 1926.150, a fully charged ABC-type 20-pound (minimum) fire extinguisher must be available within 100 feet of work utilizing a heat gun. When using the heat gun, an organic filter must be used in conjunction with the HEPA filter.

B. Once the floor covering is removed, and while still wet, place the material in a 6-mil leak-tight disposal bag and then into a second pre-labeled disposal bag. Seal the disposal bag with three wraps of duct tape. Move disposal bags to the washroom of the equipment decontamination unit.

C. Remove remaining mastic with an approved solvent or cleaner. Petroleum based solvents shall not be used. Scraping of residual mastic shall be performed using wet methods.

D. All waste materials, including mops and cleaning rags used to remove mastic, shall be disposed of as contaminated waste.

3.06 REMOVAL OF ACM BLACK MASTIC ON FOAM ROCK INSULATION

A. The abatement of black mastic at the seams of foam rock steam line insulation can be accomplished by removing sections of the insulation which contain this material for proper disposal as ACM. Place material in pre-labeled disposal bags.

3.07 REMOVAL OF ASBESTOS CEMENTITIOUS PANELS

A. Asbestos cement panels (often manufactured as Transite®) shall be removed from the building. This material shall be removed intact as much as practical. If broken for removal purposes, this shall be removed as friable asbestos-containing material.

B. The asbestos cement board shall be adequately wet prior to disturbance. The material shall be removed in complete pieces as installed if possible.

C. Scraping and/or use of a stiff bristle brush may be used to accomplish clean-up when the panel is removed. Wire brushes and pressure washers are not to be used.

D. When removal is accomplished on the inside of the building, diminished pressure shall be maintained at all times until final inspection and approval of the work area by the consultant. If removal is accomplished on the exterior of the building, drop cloth, barriers, caution tape and proper signage shall be utilized to prevent contamination of any surrounding areas and to establish a regulated area.

ADD ALTERNATE #4

END OF SECTION

DIVISION 2 - SITE WORK

SECTION 02 08 10 - REMOVAL OF ASBESTOS CONTAINING MATERIAL

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. The scope of work for the asbestos abatement of the Quonset Hut on the Gracewood Campus involves the removal of the entire remaining structure and associated debris as Regulated Asbestos-Containing Material (RACM) pending a demolition order for a State or local government agency or a determination by a professional engineer that it is unsafe for workers.

B. The structure is a Quonset hut-styled building covering approximately 7,200 square feet and is constructed of semicircular corrugated galvanized metal with a gray coating. Asbestos-containing sprayed fireproofing has been applied to the entire underside of the arched walls/ceilings and trusses. This fireproofing is in very poor condition and has delaminated onto the floor and onto all contents of the building. A PACM cementitious ceiling, otherwise known as Transite®, was identified in the front mechanical room. This ceiling has collapsed and the material has been rendered friable. A 4ft. long PACM overhead water tank, identified in this front mechanical room, could not be accessed for sampling due to structural failure.

C. In addition, all construction debris, trash, impacted soil and captured water generated by the abatement of asbestos-containing materials shall be removed from the area on a daily basis and disposed of as asbestos-containing waste.

1.02 MEDICAL REQUIREMENTS

A. Medical Examinations. Before exposure to airborne asbestos fibers, the Contractor will provide workers with a comprehensive medical examination as required by 29 CFR 1926.1101. This examination consists of a pulmonary function test and a chest x-ray at the discretion of the physician performing the physical. The same examination is required on an annual basis to all employees engaged in an occupation involving asbestos fibers.

B. Medical Records. The Contractor shall establish and maintain accurate medical surveillance records for each employee subject to medical surveillance by 29 CFR 1926.1101 and shall maintain the records for the duration of employment plus 30 years in accordance with 29 CFR 1910.20.

1.03 TRAINING CERTIFICATION AND PROJECT SUPERVISION

A. Supervision. An asbestos abatement Supervisor shall be present at all times that asbestos abatement is in progress. At all times while abatement (including preparation, removal and cleanup) of RACM is being performed at NESHAP and small projects, at least one licensed Supervisor remains inside of each contained work area supervising the work. During abatement of regulated roofing projects, the Supervisor shall be in the immediate work area supervising the work. The Supervisor shall have completed a course at an EPA approved training center or equivalent certificate course in asbestos abatement procedures and be accredited by the State of Georgia. The Supervisor shall have had a minimum of two years' on-the-job experience in asbestos abatement procedures and be a competent person as described in 29 CFR 1926.1101.

B. Worker Training. Prior to assignment to this asbestos work project, the Contractor shall provide instruction to each employee with regard to the hazards of asbestos safety and health precautions and the use and requirements of protective clothing and equipment including respirators. This instruction shall fully cover engineering and other hazard control techniques and procedures, and shall conform to training required by 40 CFR Part 763, Subpart E.

1.04 PERMITS, LICENSES, NOTIFICATIONS AND VARIANCE REQUESTS

A. The Contractor shall secure the necessary permits in conjunction with asbestos removal, hauling and

disposal, and shall provide timely notification of such actions as may be required by Federal, State or Local authorities. Ten working days' notice prior to the start of work shall be required to secure a work permit from Georgia EPD and a copy of this permit shall be submitted to the Owner prior to the start of this work. A copy of the permit shall be posted at the job site at all times.

B. Containers used to haul RACM debris from the site shall be lined with 6 mil poly and entirely sealed/encased with poly when full. If open-top, non-locking containers are used, they must be removed from the site daily.

1.05 RESPIRATORY PROTECTION PROGRAM

A. The Contractor shall have a written respiratory protection program that governs the selection, use, maintenance and care of respirators. Workers shall be provided respirators approved by the National Institute for Occupational Safety & Health (NIOSH). The respirators will be used in accordance with Occupational Safety and Health Administration (OSHA) standards.

B. All respirators must be fitted with a HEPA filter designated by NIOSH for asbestos fiber protection.

C. If/when using a heat gun to remove mastics, an organic filter must be used in conjunction with the HEPA filter.

1.06 CONTINGENCY PLAN

A. Prepare a contingency plan for emergencies including fire, accident, power failure, pressure differential system failure, supplied air system failures or other events that may require modification or abridgment of decontamination or work area isolation procedures.

B. Note that nothing in this abatement plan should impede safe exiting or providing adequate medical attention in the event of an emergency.

1.07 MECHANICAL AND ELECTRICAL SYSTEMS

A. The Contractor shall take note of where mechanical and/or electrical hazards are located and take the necessary precautions in these areas.

B. Shut down, lock, and tag out any HVAC equipment in or passing through the work area.

1.08 COMPLIANCE WITH OSHA STANDARDS

A. It is the intent of this section for the Contractor to comply fully with all Federal, State and Local regulations and codes regarding removal and disposal of asbestos-containing materials. Nothing in this section should be interpreted to conflict with this intent. The Contractor is responsible to ensure worker safety complies with Occupational Safety and Health Administration (OSHA) safety requirements. Hard hats, eye goggles, gloves, safety belts, etc., shall be worn when work tasks require this additional safety protection.

B. No attempt has been made to specify all applicable Federal and/or State requirements dealing with worker safety or public safety within the confines of these specifications. This should not be construed as an abridgment of these requirements. As is always the case, the Contractor has the responsibility to determine which non-specified requirements apply to his work and the responsibility to initiate steps to comply with these non-specified requirements on an as needed or required basis.

PART 2 - PRODUCTS

2.01 WETTING AGENTS AND ENCAPSULANTS

A. Surfactant. Provide water to which a surfactant has been added. Use a mixture of surfactant and water that results in wetting of the asbestos-containing material and retardation of fiber release during disturbance.

B. Encapsulant. Provide an encapsulant designed specifically to lock down asbestos fibers during and following asbestos abatement. Use in strict compliance with manufacturer's instructions.

2.02 POLYETHYLENE PLASTIC SHEETING

A. Provide polyethylene plastic sheeting in the largest sheet size possible to minimize seams, 4-mil and 6-mil thickness, clear, frosted and/or black, as required.

B. Polyethylene plastic sheeting shall be flame resistant (if required) and conform to the National Fire Protection Association Standard 701, "Small-Scale Fire Test for Flame-Resistant Textiles and Films."

2.03 ADHESIVES

A. Provide duct tape at least three inches wide with an adhesive formulated to stick aggressively to polyethylene plastic sheeting.

B. Provide spray adhesive formulated to stick aggressively to polyethylene plastic sheeting.

2.04 HIGH EFFICIENCY PARTICULATE AIR (HEPA) FILTERS

A. Provide vacuum cleaner, air filtration machine, and/or respirators with a HEPA filter capable of filtering particles of 0.3 microns or greater at 99.97% efficiency.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Personal Protection

1. Respirators. Provide workers with respirators that are the most comfortable and afford the best seal and protection. Cartridge filters shall be approved for respiratory protection against dusts, fumes and mists having a permissible exposure limit of less than 0.05 milligrams per cubic meter (a HEPA filter). At a minimum, workers shall be provided half-face, negative pressure respirators equipped with a HEPA filter. A clean set of cartridge filters shall be provided workers upon each entry into the regulated area. All individuals entering the asbestos control area after the commencement of asbestos removal work shall be required to wear respiratory protection.

2. Protective Clothing. A sufficient number of disposable full body coveralls shall be available to provide each worker a clean suit upon each entry into the regulated area.

B. Ground Fault Protection

1. Equip all circuits for any purpose entering the regulated area with ground fault circuit interrupters (GFCI). Locate GFCIs outside the regulated area so that all circuits are protected prior to entry into the regulated area. Provide circuit breaker type GFCI equipped with test button and reset switch for all circuits to be used for any purpose in the regulated area, decontamination unit, exterior, or as otherwise required by National Electrical Code, OSHA or other authority. Locate the panel exterior to the regulated area.
2. Use only grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Use single lengths or use waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas of work.

C. Signs and Labels

1. Warning signs shall be displayed at the entrance to the regulated area. Signs shall be posted at such a distance from the regulated area that an employee may read the signs and take necessary

protective steps before entering the area marked by the signs. The warning signs shall bear the following information:

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA
AUTHORIZED PERSONNEL ONLY

2. Labels shall be affixed to all waste bags or waste wrapped in polyethylene plastic. Labels shall be printed in large, bold letters on a contrasting background and used in accordance with the requirements of 29 CFR 1910.1200(f) of OSHA's Hazard Communication standard, and shall contain the following information:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATH DUTS
AVOID CREATING DUST

3.02 STOP WORK

A. If barriers fall or are breached in any manner, stop work immediately. Do not start work until the situation has been corrected and written authorization obtained from the Owner's Representative.

3.03 REMOVAL OF STRUCTURE AS ASBESTOS-CONTAINING MATERIAL

A. The existing structure and all debris associated with the structure shall be removed as asbestos-containing material into containers lined with two layers of 6 mil polyethylene. This shall be accomplished by a licensed asbestos abatement contractor using properly trained workers under the on-site direction of an accredited asbestos-abatement supervisor. This supervisor shall be in the regulated area during all activity including the lining of waste containers.

B. The operator of any equipment (track hoe, etc.) that is demolishing or removing debris associated with this structure to containers must be a currently accredited asbestos-abatement worker or supervisor. The material in these containers shall be “cocooned” in poly with tape and adhesive until airtight before transport to the appropriate landfill.

C. A regulated area with ample space for containers and equipment shall be delineated with barriers and proper signage. In accordance with OSHA requirements, a three-stage personnel decontamination chamber shall be on the job site consisting of a dirty room, clean room and shower.

D. Perimeter air monitoring (minimum 4 samples) shall be conducted by the Owner’s Representative air sampler during all abatement activities. This air sampler must be employed by a third party and cannot work for the abatement contractor.

E. The entire structure and all of the debris (PACM) associated with the structure shall be thoroughly wetted prior to disturbance and kept wet during the removal process.

F. Excess water or any runoff water being used to wet this material must be captured and filtered with a 5-micron filter before being discharged to a sanitary sewer. Engineering controls to aid in the capture of excess water may include the installation of polyethene sheeting on the ground with rolled up edges or secured with sandbags. Lined trenching could also be utilized with the aid of a sump pump situated at the lowest point. Polyethylene sheeting used for this purpose shall be disposed of at the end of the project with the asbestos waste. If this is impractical and if the quantity of water impacting the soil is minimal, soil

affected by water runoff can be skimmed from impacted areas of the site and disposed of as PACM.

G. An area on the job site shall be set up for the decontamination of equipment used in the regulated area or was otherwise used to handle RACM during the removal of the structure. Such equipment would include track hoes, loaders, skid steers, dump trucks, container trucks, etc. that have come into contact with the asbestos debris from the demolition or the process of loading the material into containers. This area for equipment decontamination shall have a means of capturing the water for disposal as described in Section 3.03.F above. If soil is affected by water runoff, it must be skimmed from impacted areas of the site and disposed of as PACM.

END OF SECTION

SECTION 02 08 40
DISPOSAL OF ASBESTOS-CONTAINING MATERIAL

PART 1 - GENERAL

1.01 DESCRIPTION OF THE WORK

A. This section describes the disposal of asbestos-containing material. Disposal includes packaging in properly labeled, leak-tight containers, transportation to and depositing in an approved landfill licensed to accept asbestos-containing waste.

1.02 SUBMITTALS

A. Submit the following to the Owner via the Consultant for review. Work shall not start until these submittals are returned with the Owner's action stamp or other form of written approval indicating that the submittal is returned for unrestricted use.

1. Copy of state or local license for waste hauler
2. Name and address of landfill where asbestos-containing waste materials are to be buried. Include contact person and telephone number
3. Sample Chain of Custody Form and Waste Shipment Record

PART 2 - PRODUCTS:

2.01 DISPOSAL BAGS

A. Provide 6-mil, leak-tight polyethylene bags labeled with three labels with text as follows:

First label (29 CFR 1926.1101)

CAUTION
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATH DUST
AVOID CREATING DUST

Second label (49 CFR Parts 171 and 172)

ASBESTOS
DIVISION 9
NA 2212
RQ

Third label Provide in accordance with 40 CFR Part 61, Subpart M, November 20, 1990, a label identifying the generator of the waste and the location at which the waste was generated.

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with SECTION 02 08 10 - REMOVAL OF ASBESTOS-CONTAINING MATERIALS during all phases of this work.

B. All waste is to be hauled by a waste hauler with all required licenses from all state and local authorities with jurisdiction. Mark vehicles used to transport asbestos waste with a sign 20 inches by 14 inches with text as follows:

CAUTION
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATH DUST
AVOID CREATING DUST

C. Load all asbestos-containing waste material in disposal bags, leak-tight drums, or properly lined and labeled containers.

D. Protect interior of truck cargo area and/or dumpster by lining the interior of the truck cargo area and/or dumpster with at least one layer of 6-mil polyethylene plastic sheeting held in place with duct tape and/or spray adhesive.

E. Carefully load containerized waste in fully enclosed dumpsters, trucks or other appropriate vehicles for transport. Exercise care before and during transport to ensure that no unauthorized persons have access to the material.

F. Do not store containerized materials inside the regulated area. Take containers from the regulated area directly to a sealed truck cargo area and/or dumpster. Keep truck cargo area and/or dumpster locked to prevent access by unauthorized personnel.

G. Do not transport bagged or drummed disposal materials on open trucks. Label drums with same warning labels as bags. Uncontaminated drums may be reused. Treat drums that have been contaminated as asbestos-containing waste and dispose of in accordance with this specification.

H. At a disposal site, sealed plastic bags or drums may be carefully unloaded from the truck. Do not throw bags or drums to the ground. If bags or drums are broken or damaged, return all waste to the work site for repackaging. Clean interior of the truck cargo area and/or dumpster using wet methods and HEPA vacuum. Replace polyethylene plastic sheeting after wet wiping and HEPA vacuuming.

I. Retain receipts from landfill or processor for disposed materials.

J. At completion of the project, submit copies of waste manifests, chain of custody forms, and landfill receipts to the Consultant.

END OF SECTION

SECTION 02 08 40
DISPOSAL OF ASBESTOS-CONTAINING MATERIAL

PART 1 - GENERAL

1.01 DESCRIPTION OF THE WORK

A. This section describes the disposal of asbestos-containing material. Disposal includes packaging in properly labeled, leak-tight containers, transportation to and depositing in an approved landfill licensed to accept asbestos-containing waste.

1.02 SUBMITTALS

A. Submit the following to the Owner via the Consultant for review. Work shall not start until these submittals are returned with the Owner's action stamp or other form of written approval indicating that the submittal is returned for unrestricted use.

1. Copy of state or local license for waste hauler
2. Name and address of landfill where asbestos-containing waste materials are to be buried. Include contact person and telephone number
3. Sample Chain of Custody Form and Waste Shipment Record

PART 2 - PRODUCTS:

2.01 DISPOSAL BAGS

A. Provide 6-mil, leak-tight polyethylene bags labeled with three labels with text as follows:

First label (29 CFR 1926.1101)

CAUTION
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATH DUST
AVOID CREATING DUST

Second label (49 CFR Parts 171 and 172)

ASBESTOS
DIVISION 9
NA 2212
RQ

Third label Provide in accordance with 40 CFR Part 61, Subpart M, November 20, 1990, a label identifying the generator of the waste and the location at which the waste was generated.

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with SECTION 02 08 10 - REMOVAL OF ASBESTOS-CONTAINING MATERIALS during all phases of this work.

B. All waste is to be hauled by a waste hauler with all required licenses from all state and local authorities with jurisdiction. Mark vehicles used to transport asbestos waste with a sign 20 inches by 14 inches with text as follows:

CAUTION
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
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C. Load all asbestos-containing waste material in disposal bags, leak-tight drums, or properly lined and labeled containers.

D. Protect interior of truck cargo area and/or dumpster by lining the interior of the truck cargo area and/or dumpster with at least one layer of 6-mil polyethylene plastic sheeting held in place with duct tape and/or spray adhesive.

E. Carefully load containerized waste in fully enclosed dumpsters, trucks or other appropriate vehicles for transport. Exercise care before and during transport to ensure that no unauthorized persons have access to the material.

F. Do not store containerized materials inside the regulated area. Take containers from the regulated area directly to a sealed truck cargo area and/or dumpster. Keep truck cargo area and/or dumpster locked to prevent access by unauthorized personnel.

G. Do not transport bagged or drummed disposal materials on open trucks. Label drums with same warning labels as bags. Uncontaminated drums may be reused. Treat drums that have been contaminated as asbestos-containing waste and dispose of in accordance with this specification.

H. At a disposal site, sealed plastic bags or drums may be carefully unloaded from the truck. Do not throw bags or drums to the ground. If bags or drums are broken or damaged, return all waste to the work site for repackaging. Clean interior of the truck cargo area and/or dumpster using wet methods and HEPA vacuum. Replace polyethylene plastic sheeting after wet wiping and HEPA vacuuming.

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J. At completion of the project, submit copies of waste manifests, chain of custody forms, and landfill receipts to the Consultant.

END OF SECTION

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DISPOSAL OF ASBESTOS-CONTAINING MATERIAL

PART 1 - GENERAL

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3. Sample Chain of Custody Form and Waste Shipment Record

PART 2 - PRODUCTS:

2.01 DISPOSAL BAGS

A. Provide 6-mil, leak-tight polyethylene bags labeled with three labels with text as follows:

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ASBESTOS
DIVISION 9
NA 2212
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PART 3 - EXECUTION

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J. At completion of the project, submit copies of waste manifests, chain of custody forms, and landfill receipts to the Consultant.

END OF SECTION

SECTION 02 08 40
DISPOSAL OF ASBESTOS-CONTAINING MATERIAL

PART 1 - GENERAL

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PART 2 - PRODUCTS:

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ASBESTOS
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PART 3 - EXECUTION

3.01 GENERAL

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B. All waste is to be hauled by a waste hauler with all required licenses from all state and local authorities with jurisdiction. Mark vehicles used to transport asbestos waste with a sign 20 inches by 14 inches with text as follows:

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I. Retain receipts from landfill or processor for disposed materials.

J. At completion of the project, submit copies of waste manifests, chain of custody forms, and landfill receipts to the Consultant.

END OF SECTION

DIVISION 2 – EXISTING CONDITIONS
SECTION 02 21 00 – SITE SURVEYS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the gathering of research documents, performance of a topographic survey and preparation of a topographic survey map.

1.2 DEFINITIONS

A. Professional Land Surveyor: One who possesses a valid state license as a "Professional Land Surveyor" from the state in which they practice.

B. Professional Civil Engineer: One who possesses a valid state license as a "Professional Civil Engineer" from the state in which they practice. For this section, the term "surveyor" shall also include Professional Civil Engineers authorized to practice Land Surveying under the laws of the state in which they practice.

PART 2 – EXECUTION

2.1 SURVEY

A. The surveyor shall research available public records for all mapping, monumentation, plats, governmental surveys etc. that may pertain to the subject property. Research all applicable public utilities for substructure data such as sewers, storm drains, water lines, electrical conduits, gas mains, telephone, etc.

B. The survey shall be performed on the ground in accordance with the current Measurement Standards established in the “Minimum Standard Detail Requirements for ALTA/NSPS Land Title Surveys” as adopted, from time to time, by the National Society of Professional Surveyors and the American Land Title Association.

C. The surveyor, when applicable, shall consult with the project Architect to determine scale of plat or map and size of drawings.

D. The surveyor shall furnish two sets of prints of the plat or map of survey and an electronic CADD file. If the plat or map of survey consists of more than one sheet, the sheets shall be numbered, the total number of sheets indicated and the match lines be shown on each sheet.

E. On the plat or map, the survey boundary shall be drawn to a convenient scale, or the scale designated by the Architect, with the scale clearly indicated. A graphic scale, shown in feet or meters or both, shall be included. A north arrow shall be shown and when practicable, the plat or map of survey shall be oriented so that north is at the top of the drawing. Symbols or abbreviations used shall be identified on the face of the plat or map by use of a legend or other means. Supplementary or exaggerated diagrams shall be presented accurately on the plat or map where dimensional data is too small to be shown clearly at full scale. The plat or map shall be 760 mm by 1060 mm (30 by 42 inches).

F. The survey shall contain the following applicable information:
   1. The name, address, telephone number, and signature of the Professional Land Surveyor who made the survey, his or her official seal and registration number, the date the survey was completed and the dates of all revisions.
   2. The survey drawing(s) submitted shall bear the following certification adjacent to the Engineer's official seal:
      a. "I hereby certify that all information indicated on this drawing was obtained or verified by actual measurements in the field and that every effort has been made to furnish complete and accurate information."

3. Vicinity map showing the property surveyed in reference to nearby highways or major street intersections.
4. Flood zone designation (with proper annotation based on Federal Flood Insurance Rate Maps or the state or local equivalent, by scaled map location and graphic plotting only).
5. Land area as defined by the boundaries of the legal description of the surveyed premises.
6. All data necessary to indicate the mathematical dimensions and relationships of the boundary represented by bearings and distances, and the length and radius of each curve, together with elements necessary to mathematically define each curve. The point of beginning of the surveyor's description and the basis of bearings shall also be shown.
7. When record bearings or angles or distances differ from measured bearings, angles or distances, both record and measured bearings, angles, and distances shall be clearly indicated. If the record description fails to form a mathematically closed figure, the surveyor shall so indicate.
8. Measured and record distances from corners of parcels surveyed to the nearest right-of-way lines of streets in urban or suburban areas, together with recovered lot corners and evidence of lot corners, shall be noted. The distances to the nearest intersecting street shall be indicated and verified. Names and widths of streets and highways abutting the property surveyed and widths of rights of way shall be given. Observable evidence of access (or lack thereof) to such abutting streets or highways shall be indicated. Observable evidence of private roads shall be so indicated. Streets abutting the premises, which have been described in Record Documents, but not physically opened, shall be shown and so noted.
9. The identifying titles of all recorded plats, filed maps, right of way maps, or similar documents which the survey represents, wholly or in part, with their appropriate recording data. The survey shall indicate platted setback or building restriction lines which have been recorded in subdivision plats or which appear in a Record Document which has been delivered to the surveyor. Contiguity, gores, and overlaps along the exterior boundaries of the survey premises, where ascertainable from field evidence or Record Documents, or interior to those exterior boundaries, shall be clearly indicated or noted. Where only a part of a recorded lot or parcel is included in the survey, the balance of the lot or parcel shall be indicated.
10. All evidence of found monuments shall be shown and noted. All evidence of monuments found beyond the surveyed premises on which establishment of the corners of the survey premises are dependent, and their application related to the survey shall be indicated.
11. The character of any and all evidence of possession shall be stated and the location of such evidence carefully given in relation to both the measured boundary lines and those established by the record. An absence of notation on the survey shall be presumptive of no observable evidence of possession. The term "possession" does not imply "ownership".
12. The location of all buildings upon the plot or parcel shall be shown and their locations defined by measurements perpendicular to the boundaries. If there are no buildings, so state. Proper street numbers shall be shown where available.
13. All easements evidenced by a Record Document which have been delivered to the surveyor shall be shown, both those burdening and those benefiting the property surveyed, indicating recording information. If such an easement cannot be located, a note to this affect shall be included. Observable evidence of easements and/or servitudes of all kinds, such as those created by roads, rights-of-ways, water courses, drains, telephone, telegraph, or electric lines, water, sewer, oil or gas pipelines on or across the surveyed property and on adjoining properties if they appear to affect the surveyed property, shall be located and noted. Surface indications, if any, or of underground easements and/or servitudes shall also be shown.
14. The character and location of all walls, buildings, fences, and other visible improvements within five feet of each side of the boundary lines shall be noted. Without expressing a legal opinion, physical evidence of all encroaching structural appurtenances and projections, such as fire escapes, bay windows, windows and doors that open out, flue pipes, stoops, eaves, cornices, areaways, trip, etc., by or on adjoining property or on abutting streets, on any easement or over setback lines shown by Record Documents shall be indicated with the extent of such encroachment or projection.
15. Driveways and alleys on or crossing the property must be shown. Where there is evidence of use by other than the occupants of the property, the surveyor must so indicate

on the plat or map. Where driveways or alleys on adjoining properties encroach, in whole or in part, on the property being surveyed, the surveyor must so indicate on the plat or map with appropriate measurements.

16. Location, alignment and dimensions of all roads, curbs, walks, parking and paved areas abutting the subject land. Indicate road centerlines with true bearings and lengths by 15 m (50 foot) stationing. Describe curves by designating the points of curvature and tangency by station. Include all curve data as well a location of radius and vertex points. Elevations on 15 m (50') centers on centerline of roads, edges of roads and top and bottom of curbs.
17. As accurately as the evidence permits, the location of cemeteries and burial grounds disclosed in the process of researching title to the premises or observed in the process of performing the field work for the survey, shall be shown.
18. Ponds, lakes, springs, or rivers bordering on or running through the premises being surveyed shall be shown. When a property surveyed contains a natural water boundary, the surveyor shall measure the location of the boundary according to appropriate surveying methods and note on the plat or map the date of the measurement and the caveat that the boundary is subject to change due to natural causes and that it may or may not represent the actual location of the limit of title. When the surveyor is aware of changes in such boundaries, the extent of those changes shall be identified.
19. Contours at a minimum interval of 600 mm (2 foot). Base vertical control on the permanent (not assumed) National Geodetic Survey (NGS). Note location, description and datum. Install a permanent National Geodetic Survey (NGS) Bench Mark within the property for use by any future surveyors for projects on the property. Furnish and install two monuments on the property, or property lines, that are tied to the State Plane Coordinate system, and indicate the respective Northing and Easting coordinates for the points in feet, with 3 decimal place accuracy. Provide notes that these two points are the basis for the coordinate system indicated on the CADD survey drawings. Unless specifically noted otherwise, provide CADD drawing of the survey, in DWG format in a version no older than two versions earlier than the most recent version of the software.
20. Substantial, visible improvements such as signs, parking areas, plazas, plants, benches, etc.
21. Indication of access to a public way such as curb cuts and driveways.
22. Location of utilities existing on or serving the surveyed property as determined by observed evidence together with plans and markings provided by utility companies, and other appropriate sources (with references as to the source of information. Locate and show all fire hydrants located within 150 m (500 feet) of the subject property.
23. Manholes, catch basins, valve vaults or other surface indications of subterranean uses.
24. Wires and cables (including their function) crossing the survey premises, all poles on or within ten feet of the surveyed premises, and the dimensions of all cross-wires or overhangs affecting the surveyed premises.
25. Utility company installations on the surveyed premises.
26. Names of adjoining owners of platted lands.
27. Observable evidence of earth moving work, building construction or building additions within recent months.
28. Any changes in street right-of-way lines either completed or proposed, and available from the controlling jurisdiction. Observable evidence of recent street or sidewalk construction or repairs.
29. Observable evidence of site use as a solid waste dump, sump or sanitary landfill.
30. All trees with a minimum diameter of 150 mm (6") measured at 1200 mm (48") above the base of the tree. Perimeter outline only of thickly wooded areas with description of predominant vegetation.

END OF SECTION

DIVISION 2 – EXISTING CONDITIONS
SECTION 02 41 10 – DEMOLITION & SITE CLEARING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies all site preparation work, demolition and removal of buildings, utilities, and debris from areas shown.

1.2 RELATED WORK

A. Demolition and removal of roads, walks, curbs, and on-grade slags outside buildings to be demolished: Section 31 20 00 “Earth Moving”.

B. Safety Requirements: GENERAL CONDITIONS OSHA & NFPA 241, LSC NFPA 101.

C. Salvaged items that are to remain the property of the Owner: Section 01 40 00 “Quality Requirements”.

D. Environmental Protection: Section 01 50 00 “Temporary Facilities and Controls”.

E. Waste Management: Section 01 50 00 “Temporary Facilities and Controls”.

1.3 PROTECTION

A. Perform select demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures.

B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations.

C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.

D. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area on regular schedule.

E. In addition to previously listed fire and safety rules to be observed in performance of work, include following:
   1. No wall or part of wall shall be permitted to fall outwardly from structures.
   2. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Instruct all possible users in use of fire extinguishers.
   3. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.

F. Before beginning any demolition work, survey the site and examine the drawings and specifications to determine the extent of the work. Take necessary precautions to avoid damages to existing items to remain in place, or to be reused; any damaged items shall be repaired or replaced as approved by the Architect/Engineer. Coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. Repairs, reinforcement, or structural replacement must have Architect’s approval.

H. The work shall comply with the requirements of Section 01 50 00 “Temporary Facilities and Controls”.

1.4 UTILITY SERVICES

A. Protect existing utility service lines. Perform utility locate prior to any exterior work.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 SITE CLEARING

A. General: Remove trees, shrubs, grass, and other vegetation, select concrete curb & walks, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site disposal of stumps and roots.
   1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

B. Erosion Control: 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. Install silt barriers as required prior to any soil disturbance activities. Provide temporary seeding as required by the SWPPP.

C. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.
   1. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
      a. Place fill material in horizontal layers not exceeding 150 mm (6 inches) loose depth, and thoroughly compact each layer to a density equal to adjacent original ground.

3.2 SELECT DEMOLITION

A. Demolish and remove site improvements as indicated, including all appurtenances related or connected thereto, as noted below:
   1. As required for installation of new handicap curb-cut ramp.

B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him daily, off the Property to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified. Break up concrete slabs below grade that do not require removal from present location into pieces not exceeding (24 inches) square to permit drainage. Contractor shall dispose debris in compliance with applicable state or local permits, rules and/or regulations.

C. Remove and legally dispose of all waste materials, other than earth work spoils to remain on site in trash dumps. Materials removed shall become property of contractor and shall be disposed of in compliance with applicable federal, state or local permits, rules and/or regulations disposal site. Materials that are located beneath the surface of the surrounding ground more than 1500 mm (5 feet), or materials that are discovered to be hazardous, shall be handled as unforeseen. Burning is not permitted on the property.

D. Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Architect & City of Richmond County. When Utility lines are encountered that are not indicated on the drawings, the Architect & Owner shall be notified prior to further work in that area.

3.2 CLEAN-UP

A. On completion of work of this section and after removal of all debris, leave site in clean condition satisfactory to Architect. Clean-up shall include disposal off the property of all items and materials

not required to remain property of the Owner as well as all debris and rubbish resulting from demolition operations.

B. Protect existing work to remain and leave free of damage or soiling. Protect all new work.

END OF SECTION

DIVISION 2 – EXISTING CONDITIONS
SECTION 02 41 18 – DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Selective demolition and removal of selected portions of existing building interior and exterior slab & walls.
2. Disconnecting, capping or sealing, and removing utilities for extension to new locations.
3. Removal and replacement of select mechanical, plumbing & electrical systems.

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. General Conditions for Schedules and Coordination procedures for demolition operations.
2. Section 01 56 30 “Decontamination Units for Asbestos Abatement” and attachments.
3. Section 01 71 10 “Project Decontamination for Asbestos Abatement” and attachments.
4. Section 01 80 00 “Site Cleanup & Post Project Submittals” and attachments.
5. Section 02 08 10 “Removal of Asbestos Containing Material”.
6. Section 02 08 40 “Disposal of Asbestos-Containing Material”.

1.2 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 store in Owner's designated storage area.

C. Existing to Remain: Protect construction indicated to remain against damage and soiling during demolition.

1.3 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.
1. Proposed dust-control & work isolation measures.
2. Proposed noise-control measures.
3. Temporary enclosure for security & weather tight envelop. (Roof & walls)

B. Schedule of demolition activities indicating the following:
1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
2. Dates for shutoff, capping, and continuation of utility services.
3. Dates for turn-over of salvaged items to Owner.

C. Record drawings at Project closeout according to Section 01 77 00 "Closeout Procedures”.
1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed

demolition Work similar to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA & EPD notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 PROJECT CONDITIONS

A. Building areas scheduled for selective demolition will be vacated and their use discontinued before start of Work. Adjacent areas will remain occupied and egress must be maintained.
1. Contractor must conform to NFPA 241 & identify interim life safety.

B. Owner assumes no responsibility for actual condition of buildings to be selectively demolished.
1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner as far as practical.

C. Storage or sale of removed items or materials on-site will not be permitted.

1.7 SCHEDULING

A. Arrange demolition schedule to not interfere with other site clearing operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Authorized installers shall be utilized to remove, relocate and reinstall equipment where noted.

B. Reinstall systems and equipment using only manufacturers approved parts and installation details.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities to be removed have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of demolition.

C. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

3.2 UTILITY SERVICES

A. Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.

B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving areas to be demolished.

C. Refer to Divisions 22, 23 & 26 Sections for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with 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 (AHJ). Provide alternate routes around closed or obstructed traffic pathways 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 demolition area.
   1. Erect barriers to prevent unauthorized access to hazardous areas of the work.

D. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of work to remain & trenching or excavations.

3.4 POLLUTION CONTROLS

A. Use water mist, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
   1. Do not create hazardous or objectionable conditions, such as ice, flooding, and pollution, when using water.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

C. Clean adjacent improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

3.5 DEMOLITION

A. Use methods required to complete Work within limitations of governing regulations and as follows:
   1. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
   2. Demolish concrete and masonry in small sections. Saw cut concrete & masonry for clean joints & terminations.
   3. Remove work noted for salvage without damaging.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site. Transport demolished materials off Owner's property and legally dispose of them.

B. Burning: Do not burn demolished materials.

3.7 SALVAGE AND REUSE

A. Storage of materials in areas of work is acceptable only if no damage to salvaged items and other finishes is assured.

END OF SECTION

DIVISION 3 – CONCRETE
SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 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.

1.3 TESTING AGENCY FOR CONCRETE MIX DESIGN

A. Testing agency for the trial concrete mix design retained and reimbursed by the Contractor and approved by COR. For all other testing, refer to Section 01 45 29 Testing Laboratory Services.

B. Testing agency maintaining active participation in Program of Cement and Concrete Reference Laboratory (CCRL) of National Institute of Standards and Technology.

C. Testing agency shall furnish equipment and qualified technicians to establish proportions of ingredients for concrete mixes.

1.4 REGULATORY REQUIREMENTS

A. ACI SP-66 – ACI Detailing Manual.

B. ACI 318 - Building Code Requirements for Reinforced Concrete.

C. ACI 301 – Standard Specifications for Structural Concrete.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review special inspection and testing and inspecting agency procedures for field quality control, and concrete protection.

1.6 TOLERANCES

A. Formwork: ACI 117, except the elevation tolerance of formed surfaces before removal of shores is +0 mm (+0 inch) and -20 mm (-3/4 inch).

B. Reinforcement Fabricating and Placing: ACI 117, except that fabrication tolerance for bar sizes Nos. 10, 13, and 16 (Nos. 3, 4, and 5) (Tolerance Symbol 1 in Fig. 2.1(a), ACI, 117) used as column ties or stirrups is +0 mm (+0 inch) and -13 mm (-1/2 inch) where gross bar length is less than 3600 mm (12 feet), or +0 mm (+0 inch) and -20 mm (-3/4 inch) where gross bar length is 3600 mm (12 feet) or more.

C. Cross-Sectional Dimension: ACI 117, except tolerance for thickness of slabs 12 inches or less is +20 mm (+3/4 inch) and - 6 mm (-1/4 inch). Tolerance of thickness of beams more than 300 mm (12 inch) but less than 900 mm (3 feet) is +20 mm (+3/4 inch) and -10 mm (-3/8 inch).

D. Slab Finishes: ACI 117, Section 4.5.6, F-number method in accordance with ASTM E1155, except as follows:

1. Test entire slab surface, including those areas within 600 mm (2 feet) of construction joints and vertical elements that project through slab surface.
2. Maximum elevation change which may occur within 600 mm (2 feet) of any column or wall element is 6 mm (0.25 inches).
3. Allow sample measurement lines that are perpendicular to construction joints to extend past joint into previous placement no further than 1500 mm (5 feet).

1.7 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, hoop spacing, and supports for concrete reinforcement.

1.8 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
2. Admixtures.
3. Waterstops.
4. Curing compounds.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Conform to ACI 304. Store aggregate separately for each kind or grade, to prevent segregation of sizes and avoid inclusion of dirt and other materials.

B. Deliver cement in original sealed containers bearing name of brand and manufacturer, and marked with net weight of contents. Store in suitable watertight building in which floor is raised at least 300 mm (1 foot) above ground. Store bulk cement and fly ash in separate suitable bins.

C. Deliver other packaged materials for use in concrete in original sealed containers, plainly marked with manufacturer's name and brand, and protect from damage until used.

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

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

1.10 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.

1.11 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.

B. American Concrete Institute (ACI):
117-10 .....Specifications for Tolerances for Concrete Construction and Materials and Commentary
211.1-91(R2009).....Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
214R-11(R2019).....Guide to Evaluation of Strength Test Results of Concrete
301-16 .....Specifications for Structural Concrete
304R-00(R2009).....Guide for Measuring, Mixing, Transporting, and Placing Concrete
305.1-14.....Specification for Hot Weather Concreting
306.1-90(R2002).....Standard Specification for Cold Weather Concreting
308.1-11.....Specification for Curing Concrete
309R-05.....Guide for Consolidation of Concrete
318/318-19 .....Building Code Requirements for Structural Concrete and Commentary
347R-14.....Guide to Formwork for Concrete
SP-66-04.....ACI Detailing Manual

C. American National Standards Institute and American Hardboard Association
A135.4-2012.....Basic Hardboard

D. ASTM International (ASTM):
A615/A615M-20.....Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement
A1064/A1064M-18a.....Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
C31/C31M-19a .....Standard Practice for Making and Curing Concrete Test Specimens in the field
C33/C33M-18.....Standard Specification for Concrete Aggregates
C39/C39M-20.....Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C94/C94M-19a .....Standard Specification for Ready Mixed Concrete
C143/C143M-20.....Standard Test Method for Slump of Hydraulic Cement Concrete
C150C150M-20.....Standard Specification for Portland Cement
C172C172M-17.....Standard Practice for Sampling Freshly Mixed Concrete
C173/C173M-16.....Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
C192/C192M-19.....Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
C231/C231M-17a .....Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
C260/C260M-10a(2016)....Standard Specification for Air Entraining Admixtures for Concrete
C309-19.....Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete
C494/C494M-19.....Standard Specification for Chemical Admixtures for Concrete
C618-19.....Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
C666/C666M-15.....Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

C1107/1107M-20.....Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
C1315-19 .....Standard Specification for Liquid Membrane Forming Compounds Having Special Properties for Curing and Sealing Concrete
D4263-83(2018) .....Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
E1155-20 .....Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers
F1249-20 .....Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor
F1869-16a.....Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

E. American Welding Society (AWS):
D1.4/D1.4M-18 .....Structural Welding Code – Steel Reinforcing Bars

F. Concrete Reinforcing Steel Institute (CRSI):
Handbook 2008

PART 2 - PRODUCTS

2.1 FORMS

A. Wood: PS 20 free from loose knots and suitable to facilitate finishing concrete surface specified; tongue and grooved.

B. Plywood: PS-1 Exterior Grade B-B (concrete-form) 16 mm (5/8 inch), or 20 mm (3/4 inch) thick for unlined contact form. B-B High Density Concrete Form Overlay optional.

C. Concrete products shall comply with following standards for biobased materials:

Material Type	Percent by Weight
Concrete Penetrating Liquid	79 percent biobased material
Concrete form Release Agent	87 percent biobased material
Concrete Sealer	11 percent biobased material

The minimum-content standards are based on the weight (not the volume) of the material.

2.2 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI SP-66.
2. ACI 301.
3. ACI 117.

2.3 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.

2.4 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.

2.5 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, gray.
2. Fly Ash: ASTM C 618, Class F or C.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 1N coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
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. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

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

G. Coarse Aggregate: ASTM C33.
1. Size 67 or Size 467 may be used for footings and walls over 300 mm (12 inches) thick.
2. Coarse aggregate for interior slabs on grade shall conform to the following:
    a. Dense or well graded aggregate.
        1) Percent retained on each sieve below the top size and above the No. 100 sieve:
            a) 8 to 18 percent for 1-1/2 inches (38 mm)top size.
            b) 8 to 22 percent for 3/4 or 1 inch (19 or 25 mm) top size.
        2) The above requirements may be deviated from based on locally available material.
            a) One or two non-adjacent sieves sizes may fall outside of the limits set above.
            b) Percent retained on two adjacent sieves sizes shall not be less than 5 percent of the above required.
            c) Percent retained on three adjacent sieve sizes shall not be less than 8 percent of the above required.
            d) When the percent retained on each of two adjacent sieve sizes is less than 8 percent the total percent retained on either of these sieves and the adjacent outside sieve should be at least 13 percent (for example, if both the No. 4 and No. 8 (4.75 and 2.36 mm)sieves have 6 percent retained on each item then: 1. the total retained on the 3/8 inch and No. 4 (9.5 and 4.75 mm) sieves should be at least 13 percent, and 2. the total retained on the No. 8 and No. 16 (2.36 and 1.18 mm) sieves should be at least 13 percent.
3. Maximum size of coarse aggregates not more than one-fifth of narrowest dimension between sides of forms, one-third of depth of slabs, nor three-fourth of minimum clear spacing between reinforcing bars.

H. Fine Aggregate: ASTM C33. Fine aggregate for applied concrete floor topping shall pass a 4.75 mm (No. 4) sieve, 10 percent maximum shall pass a 150 µm (No. 100) sieve.

I. Mixing Water: Fresh, clean, and potable.

J. Admixtures:
1. Water Reducing Admixture: ASTM C494, Type A and not contain more chloride ions than are present in municipal drinking water.
2. Water Reducing, Retarding Admixture: ASTM C494, Type D and not contain more chloride ions than are present in municipal drinking water.
3. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water. Use of superplasticizer requires COR approval.
4. Non-Corrosive, Non-Chloride Accelerator: ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. Admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory of at least one year duration using an acceptable accelerated corrosion test method such as that using electrical potential measures.
5. Air Entraining Admixture: ASTM C260.
6. Calcium Nitrite corrosion inhibitor: ASTM C494 Type C.
7. Prohibited Admixtures: Calcium chloride, thiocyanate or admixtures containing more than 0.05 percent chloride ions are not permitted.
8. Certification: Written conformance to the requirements above and the chloride ion content of the admixture prior to mix design review.

K. Vapor Barrier: ASTM F1249, 0.38 mm (15 mil) WVT 0.007 foot/hour.

L. Reinforcing Steel: ASTM A615, or ASTM A996, deformed, grade as shown.

M. Welded Wire Fabric: ASTM A185.

N. Supports, Spacers, and Chairs: Types which will hold reinforcement in position shown in accordance with requirements of ACI 318 except as specified.

O. Expansion Joint Filler: ASTM D1751.

P. Liquid Membrane-forming Compounds for Curing Concrete: ASTM C309, Type I, with fugitive dye, and shall meet the requirements of ASTM C1315.Compound shall be compatible with scheduled surface treatment, such as paint and resilient tile, and shall not discolor concrete surface.

Q. Abrasive Aggregate: Aluminum oxide grains or emery grits.

R. Non-Shrink Grout:
1. ASTM C1107, pre-mixed, produce a compressive strength of at least 18 MPa at three days and 35 MPa (5000 psi) at 28 days. Furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent bearing under a 1200 mm x 1200 mm (4 foot by 4 foot) base plate.
2. Where high fluidity or increased placing time is required, furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent under an 450 mm x 900 mm (18 inch by 36 inch) base plate.

S. Adhesive Binder: ASTM C881.

T. Porous Backfill: Crushed stone or gravel graded from 25 mm to 20 mm (1 inch to 3/4 inch).

U. Fibers:
1. Synthetic Fibers: Monofilament or fibrillated polypropylene fibers for secondary reinforcing of concrete members. Use appropriate length and 0.9 kg/m3 (1.5 lb. per cubic yard). Product shall have a UL rating.

V. Epoxy Joint Filler: Two component, 100 percent solids compound, with a minimum shore D hardness of 50.

W. Bonding Admixture: Non-rewettable, polymer modified, bonding compound.

2.6 FIBER REINFORCEMENT

A. Synthetic Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III.

2.7 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

B. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

2.8 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class B, Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.9 CURING MATERIALS

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

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

C. Water: Potable.

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

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.11 CONCRETE MIXTURES

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: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 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.

E. Mix Designs: Proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318.
1. If trial mixes are used, make a set of at least 6 cylinders in accordance with ASTM C192 for test purposes from each trial mix; test three for compressive strength at 7 days and three at 28 days.
2. Submit a report of results of each test series, include a detailed listing of the proportions of trial mix or mixes, including cement, fly ash, admixtures, weight of fine and coarse aggregate per m3 (cubic yard) measured dry rodded and damp loose, specific gravity, fineness modulus, percentage of moisture, air content, water-cement, fly ash, ratio, and consistency of each cylinder in terms of slump.
3. Prepare a curve showing relationship between water-cement, fly ash ratio at 7-day and 28-day compressive strengths. Plot each curve using at least three specimens.
4. If the field experience method is used, submit complete standard deviation analysis.

F. Fly Ash Testing: Submit certificate verifying conformance with ASTM 618 initially with mix design and for each truck load of fly ash delivered from source. Submit test results performed within 6 months of submittal date. Notify the COR immediately when change in source is anticipated.
1. Testing Laboratory used for fly ash certification/testing shall participate in the Cement and Concrete Reference Laboratory (CCRL) program. Submit most recent CCRL inspection report.

G. After approval of mixes no substitution in material or change in proportions of approval mixes may be made without additional tests and approval of the COR or as specified. Making and testing of preliminary test cylinders may be carried on pending approval of cement and fly ash, providing Contractor and manufacturer certify that ingredients used in making test cylinders are the same. The COR may allow Contractor to proceed with depositing concrete for certain portions of work, pending final approval of cement and fly ash and approval of design mix.

H. Cement Factor: Maintain minimum cement factors in Table I regardless of compressive strength developed above minimums. Use Fly Ash as an admixture with maximum of 25 percent replacement by weight in all structural work. Increase this replacement to 40 percent for mass concrete, and reduce it to 10 percent for drilled piers and caissons.

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

Concrete Strength		Non-Air-Entrained	Air-Entrained	
Min. 28 Day Comp. Str. MPa (psi)	Min. Cement kg/m3 (lbs/c. yd)	Max. Water Cement Ratio	Min. Cement kg/m3 (lbs/c. yd)	Max. Water Cement Ratio
35 (5000)1,3	375 (630)	0.45	385 (650)	0.40
30 (4000)1,3	325 (550)	0.55	340 (570)	0.50
25 (3000)1,3	280 (470)	0.65	290 (490)	0.55

1. If trial mixes are used, the proposed mix design shall achieve a compressive strength 8.3 MPa (1200 psi) in excess of f'c. For concrete strengths above 35 Mpa (5000 psi), the proposed mix design shall achieve a compressive strength 9.7 MPa (1400 psi) in excess of f'c.
2. For concrete exposed to high sulfate content soils maximum water cement ratio is 0.44.

I. Maximum Slump: Maximum slump, as determined by ASTM C143 with tolerances as established by ASTM C94, for concrete to be vibrated shall be as shown in Table II.

TABLE II - MAXIMUM SLUMP, MM (INCHES)

Type of Construction	Normal Weight Concrete	
Reinforced Footings and Sub-structure Walls	75mm (3 inches)	
Slabs, Beams, Reinforced Walls, and Building Columns	100 mm (4 inches)	

J. Slump may be increased by the use of the approved high-range water-reducing admixture (superplasticizer). Tolerances as established by ASTM C94. Concrete containing the high-range-water-reducing admixture may have a maximum slump of 225 mm (9 inches). The concrete shall arrive at the job site at a slump of 50 mm to 75 mm (2 inches to 3 inches), and 75 mm to 100 mm (3 inches to 4 inches) for lightweight concrete. This should be verified, and then the high-range-water-reducing admixture added to increase the slump to the approved level.

K. Air-Entrainment: Air-entrainment of normal weight concrete shall conform with Table III. Air-entrainment of lightweight structural concrete shall conform with Table IV. Determine air content by either ASTM C173 or ASTM C231.

TABLE III - TOTAL AIR CONTENT
FOR VARIOUS SIZES OF COARSE AGGREGATES (NORMAL CONCRETE)

Nominal Maximum Size of Total Air Content	Coarse Aggregate, mm (Inches) Percentage by Volume
10 mm (3/8 in).6 to 10	13 mm (1/2 in).5 to 9
20 mm (3/4 in).4 to 8	25 mm (1 in).3-1/2 to 6-1/2
40 mm (1 1/2 in).3 to 6	

L. Concrete slabs placed at air temperatures below 10 degrees C (50 degrees Fahrenheit) use non-corrosive, non-chloride accelerator. Concrete required to be air entrained use approved air entraining admixture. Pumped concrete, synthetic fiber concrete, architectural concrete, concrete required to be watertight, and concrete with a water/cement ratio below 0.50 use high-range water-reducing admixture (superplasticizer).

M. Durability: Use air entrainment for exterior exposed concrete subjected to freezing and thawing and other concrete shown or specified. For air content requirements see Table III or Table IV.

N. Enforcing Strength Requirements: Test as specified in Section 01 45 29 “Testing Laboratory Services”, during the progress of the work. Seven-day tests may be used as indicators of 28-day strength. Average of any three 28-day consecutive strength tests of laboratory-cured specimens representing each type of concrete shall be equal to or greater than specified strength. No single test shall be more than 3.5 MPa (500 psi) below specified strength. Interpret field test results in accordance with ACI 214. Should strengths shown by test specimens fall below required values, the A/E may require any one or any combination of the following corrective actions, at no additional cost to the Government:

1. Require changes in mix proportions by selecting one of the other appropriate trial mixes or changing proportions, including cement content, of approved trial mix.
2. Require additional curing and protection.
3. If five consecutive tests fall below 95 percent of minimum values given in Table I or if test results are so low as to raise a question as to the safety of the structure, the COR may direct Contractor to take cores from portions of the structure. Use results from cores tested by the Contractor retained testing agency to analyze structure.

4. If strength of core drilled specimens falls below 85 percent of minimum value given in Table I, the COR may order load tests, made by Contractor retained testing agency, on portions of building so affected. Load tests in accordance with ACI 318 and criteria of acceptability of concrete under test as given therein.
5. Concrete work, judged inadequate by structural analysis, by results of load test, or for any reason, shall be reinforced with additional construction or replaced, if directed by the A/E.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Normal-weight concrete.
1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 4 inches, plus or minus 1 inch.

B. Slabs-on-Grade: Normal-weight concrete.
1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Minimum Cementitious Materials Content: 470 lb/cu. yd..
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
6. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.5 lb/cu. yd..

2.13 FABRICATING REINFORCEMENT

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

2.14 CONCRETE MIXING

A. General: Concrete shall be "Ready-Mixed" and comply with ACI 318 and ASTM C94, except as specified. Batch mixing at the site is permitted. Mixing process and equipment must be approved by the COR. With each batch of concrete, furnish certified delivery tickets listing information in Paragraph 16.1 and 16.2 of ASTM C94. Maximum delivery temperature of concrete is 38 degrees C (100 degrees Fahrenheit). Minimum delivery temperature as follows:

Atmospheric Temperature	Minimum Concrete Temperature
-1. degrees to 4.4 degrees C (30 degrees to 40 degrees F)	15.6 degrees C (60 degrees F.)
-17 degrees C to -1.1 degrees C (0 degrees to 30 degrees F.)	21 degrees C (70 degrees F.)

1. Services of aggregate manufacturer's representative shall be furnished during the design of trial mixes and as requested by the COR for consultation during batching, mixing, and placing operations of lightweight structural concrete. Services will be required until field controls indicate that concrete of required quality is being furnished. Representative shall be thoroughly familiar with the structural lightweight aggregate, adjustment and control of mixes to produce concrete of required quality. Representative shall assist and advise the A/E.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

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

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

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
1. Class B, 1/4 inch for rough-formed finished surfaces.

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

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

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

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

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

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

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

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

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

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3.3 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

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.

3.5 JOINTS

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

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

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, grade beams, and other locations, as indicated.

3.6 WATERSTOP INSTALLATION

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, 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.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly to drains where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.8 FINISHING FLOORS AND SLABS

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

B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
   2. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

3.9 CONCRETE PROTECTING AND CURING

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

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

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

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

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. 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.

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

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

3.11 FIELD QUALITY CONTROL

A. Special Inspections: Laboratories for material testing and/or testing agencies for testing/inspection services shall be selected by, engaged by, and responsible to the Design Professional.

B. Inspections:
1. Steel reinforcement placement.
2. Headed bolts and studs.
3. Verification of use of required design mixture.
4. Concrete placement, including conveying and depositing.

C. 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.
7. 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.

8. 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.
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.
10. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
11. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION

DIVISION 3 – CONCRETE
SECTION 03 48 21 – PRECAST CONCRETE BURIAL CRYPTS (DOUBLE DEPTH LAWN CRYPT)

PART 1 – GENERAL

1.1 DESCRIPTION

A. The work of this Section is to furnish all labor, materials, manpower, tools and equipment required to complete the manufacturing and installation of the precast concrete burial crypts as specified and/or shown, including but not limited to the work to:
   1. Fabricate
   2. Transport and deliver to site
   3. Unload units on dunnage or gravel
   4. Store and/or install precast concrete burial crypts (units or crypts)
   5. Install subbase foundation and drainage
   6. Install units in the prepared crypt fields
   7. Backfill between and around the crypts
   8. Install sand and/or backfill on top of crypts
   9. Compact fill materials
   10. Topsoil
   11. Provide additional Materials:
      a. Three (3) OSHA -approved crypt lid lifting apparatus
      b. Five (5) extra concrete crypt lids
      c. A device to easily retrieve and lower the inside shelf by one man without entering the crypt.
   12. Other Associated Work

1.2 DESIGN OVERVIEW

A. The design of the units shall be as described in this Section and their installation layout shall be as illustrated on the Drawings. Design requirements shall be as follows:
   1. All perimeter crypts shall be structurally designed for overhead and lateral soil pressure plus live loads specified hereafter.
   2. All designs will require that the manufacturer provide fabrication drawings stamped by a Professional Engineer indicating that the design meets or exceeds the structural requirements contained herein.
   3. Alternative crypt component designs may be proposed if all the following requirements are met:
      a. Comply with the design criteria and the functional tests of this specification.
      b. All provisions of this specification shall apply to any proposed alternative design.
      c. The Government may accept or reject part or all of any proposed alternative design. The Contractor will pay for all cost for alternate designs, submittals, and reviews.

1.3 RELATED WORK

A. Section 01 33 00 “Submittals”.

B. Excavation and Backfill: Section 31 20 00 “Earth Moving”.

C. Materials Testing and Inspection during Fabrication and Construction: Section 01 45 29 “Testing Laboratory Services”.

1.4 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Bid documents shall include documentation that manufacturer has a minimum of three years of experience with pre-casting units of similar type. Current plant certification for the location(s) that will be producing units for this project from the National

Precast Concrete Association (NPCA) shall be provided as a submittal prior to any work being performed.

B. Provide a written stamped certification from a licensed Structural Engineer that certifies that the units being manufactured conform to the specified design and performance requirements.

C. Installation Qualifications: Provide written documentation that verifies:
1. The installer has been regularly engaged, for at least three years, in installation of pre-cast concrete similar to this project.

D. Fabricate crypts to the interior dimensions described below.
1. Replace or repair units that do not comply with the individual dimensions and tolerances.

E. Prior to, or in the initial stage of crypt production, furnish at the site:
1. Proposed shelf removal tool.
2. Two (2) perimeter crypts.
3. One (1) interior crypt.
   a. The three (3) crypts shall:
      1) Demonstrate acceptable quality of construction.
      2) Be used to conduct the on-site buried crypt functional load test as described herein below.

F. Functional Load Tests: Functional on-site load tests shall be made at the Contractor's expense to ensure the units are capable of supporting loads stated. The load testing shall be witnessed by the Owner, Architect/Engineer, or other approved Government representative. Qualified individuals may include a structural engineer, RE, District Engineer, Project Manager, or another qualified individual. The functional tests shall consist of following loading conditions:
1. Confined Loading: An interior unit between two perimeter units shall:
   a. Be placed in a hole dug in the ground on site and covered with 600 mm (24 inches) of soil or covered to the maximum depth as shown on the plans, whichever is greater.
      1) The soil shall be compacted to Standard Proctor (ASTM D698) 95% density along the sides of the crypt and 85% density over the lid.
         a) Impact type of equipment shall not be used on the sides of the crypts as they can cause conditions that exceed the design parameters.
   b. An axle load of 5500 kg (12,000 lbs.) shall be passed over the covered crypts for a minimum of 10 times in repetition as follows:
      1) In a manner that causes maximum lateral pressure due to wheel load on the sides of the crypts.
   c. The crypts shall then:
      1) Be fully excavated, exposed and the lids removed to allow careful examination inside and outside.
         a) The crypts must not show any signs of stress or cracking.
2. Shelf Load Testing for the intermediate shelf shall be as follows:
   a. Apply 200-pound load to individual support struts.
      1) Shift weight to test each individual support to confirm structural integrity and load bearing capability.
      2) Worker shall adhere to all safety regulations while performing test.
   b. Upon completion of shelf load testing, the inside shelf shall be removed by the removal tool as follows:
      1) Without entering the crypt and by one man.
      2) Inspected and lowered back into the crypt in the 2nd interment position.
      3) The inside shelf must not show any signs of stress, cracking or deflection.
3. Demonstrate the removal and replacement process for the inside shelf. The functioning of the shelf removal tool shall be approved by the Architect/Engineer.

G. Commence production of crypts only after the written submittal(s) are approved and functional on-site load testing and demonstration have been successfully completed.

1.7 DESIGN CRITERIA

A. Design Criteria (Double Depth Crypt): All design calculations and drawings shall be signed and sealed by qualified licensed Structural Engineer licensed in the state where the work shall occur.

1. The units shall be of the following type, style, and size:
   a. Type: Precast concrete.
   b. Style: One-piece box with separate outer lid and the following:
      1) A removable one-piece inside shelf
      2) Four casket risers or two casket support bars
      3) Drain Holes 100 mm (4-inch) diameter in the floor bottom as follows:
         a) Two drain holes at opposite ends when there are casket risers.
         b) Three drain holes at opposite ends and in middle, when there are two support bars.
   c. Crypt interior size: Interior minimum dimensions are as follows:
      1) 750 mm (30-inches; 2’-6”) minimum width at the inside bottom floor and for the full height of the crypt
      2) 2.2 m (86-inches; 7’-2”) minimum length along the inside bottom floor and for the full height of the crypt
      3) 640 mm (25-inches; 2’-1”) minimum clear height from the highest part of the inside shelf to the underside of the lid
      4) 640 mm (25-inches; 2’-1”) minimum clear height from the lowest part of the inside shelf to the top of the casket risers
      5) 20 mm (3/4 inch) minimum height casket risers from the crypt floor spaced 500 mm (20-inches; 1’-8”) from crypt centerline to eliminate pinching of the lowering straps during removal. Four risers required.
   d. Crypt height and wall thickness:
      1) Exterior maximum height dimension: 1.6 m (60-inches; 5’-0”) including the lid.
      2) Crypt wall thickness: 50 mm minus 12mm (2-inches minus 1/2 inch) for inside shelf bearing.
      3) Perimeter crypts are allowed thicker walls where additional reinforcing is included.
      4) Crypt wall sections at support slots originated from the top for the inside shelf may be of lesser thickness.
   e. Layout:
      1) Crypts shall fit in a 920 mm by 2450 mm (3-foot by 8-foot) plot, or a lesser plot size as noted on the plans.
      2) The lesser plot size shall govern. If the proposed crypts will not fit into the designed/indicated plot size, with adequate room for backfill between crypts, or if a different plot size is suggested, the Contractor, at no cost to the Government, shall prepare a revised Layout/Size Plan and submit it for review and approval by the Architect/Engineer.
2. Load Conditions for design of units shall be as follows:
   a. A burial depth with soil cover as indicated on the plans.
   b. A center point load of 2700 kg (6,000 lbs.) on one square foot, prior to burial.
   c. Passage of a wheel axle load of 5500 kg (12,000 lbs.) after burial.
   d. A 900 mm (3-foot) tall pile of excavated material on top of or adjacent to buried crypts.
3. Submit to the Architect/Engineer for approval the following:
   a. Five sets of design documentation showing structural design of the units.
      1) This documentation shall include dimensions, methods of construction, and calculations.
   b. The Structural Engineer that stamps the design calculations and drawings shall provide:
      1) Written recommendations indicating the extent of voids that are allowable in the produced units, without causing any degradation of loading capacity from the design load values.
      2) Written recommendations on the conditions where repairs will be allowed, and materials and methods to be used for repairs.

3) Written statement that all repairs to the units shall only be allowed if they are performed according to the written recommendations of the Structural Engineer.

B. Design Criteria (Concrete Lids):
1. To be removable and replaceable.
2. Lid lifting shall be from top positioned hot-dipped galvanized anchors (4-required per lid) with removable anchor covers to prevent dirt from entering the anchor bowl and installed in such a manner as to stay in-place when excavating equipment is scraping backfill off the top of the lid.
a. Furnish the cemetery with three (3) OSHA approved and tag certified wire rope lifting devices for removing the lid. No chain lifting devices allowed.

C. Design Criteria (Inside shelf):
1. One-piece rigid construction
2. Fully conceal the lower casket with a rigid barrier
3. Weigh 18 kg (40 lbs.) or less
4. Allow for easy casket lowering belt removal
5. Capable of holding 180 kg (400 lbs.) indefinitely.
6. The entire inside shelf should be rigid, non-brittle, non-deteriorating, and have a maximum 6 mm (1/4 inch) gap from all shelf edges to the crypt wall to create a visual barrier.
7. Have one lifting hole in the middle about 50 mm (2-inches) from the edge 19 mm (3/4-inch) maximum diameter.

D. Design Criteria (Inside Shelf Removal Tool(s):
1. Be constructed so one man can easily retrieve and install the shelf from ground level without entering the crypt.
a. Demonstrate the use and functionality of said tool at the crypt buried load testing, for the conditions that will occur at the cemetery during the interments at the crypt sections(s).

E. Design Criteria (Quad Crypt):
1. An alternate concrete Quad unit (one piece) may be used as an approved equal in lieu of two (2) double depth lawn crypt units. The Quad units shall conform to all other specified herein including:
a. The shared interior concrete wall thickness may be increased to allow for a gap between lids as deemed appropriate to meet layout requirements.

F. Design Criteria (Oversized Crypt):
1. Oversized crypts shall conform to all provisions of this section with the exception that the Interior dimensions and Wall thickness are as follows:
a. 1065 mm by 2335 mm (42-inches by 92-inches; 3’-6” by 7’-8”) inside clear span
b. Oversized crypt wall thickness: 65 mm – 12 mm (2-1/2 inches minus 1/2 inch) for inside shelf bearing.

G. Miscellaneous manufacturing requirements:
1. The concrete lid shall be beveled along the entire top perimeter. Chamfer top edge of lid with a 1:1 chamfer beginning 12 mm (1/2 inch) down from top.
2. The design of casket risers, whether individual spots or bars crossing the bottom, shall allow the casket to rest a minimum of 19 mm (3/4 inch) above the inside floor of the crypt and above the top of the inside shelf in order to aid in casket lowering straps removal. In addition, rest location shall not exceed 530 mm (21 inches; 1’-9”) from crypt centerline.
3. The crypt outside lifting wire shall be designed for transport and installation along with provisions for removal/abandonment of crypt lifting wire once crypt has been installed.

1.8 ALLOWABLE TOLERANCES

A. Tolerances of individual units shall be as follows:
   1. Variation in overall crypt outside dimensions of unit (height, length and width): 3 mm (1/8") plus or minus. There is zero tolerance for any lesser crypt inside minimum clear dimensions.
   2. Variation in thickness of precast panels and elements: 1.5 mm (1/16") plus or minus.
   3. Maximum height differential in final placement in the ground: 6 mm (1/4") above or below design grade.
   4. Cracks greater than 0.75 mm (0.030 inches) in width are cause for crypt rejection. With evidence of fiber or steel reinforcement, any cracking 0.75 mm (0.030") or lesser width that does **not** extend thru wall is acceptable. Any cracking 0.4 mm (0.016 inch) or lesser that extends thru wall is acceptable. All other cracks are cause for rejecting crypts that shall be repaired or removed and replaced at no cost to VA.

1.9 SUBMITTALS

A. In accordance with Section 01 33 00 "Submittals" within 45 days of the approval of the shop drawings, furnish to the Architect/Engineer the following:
   1. Samples: deliver to the site for testing and inspection:
      a. Two perimeter crypts and one interior crypt.

B. Submit a detailed concrete Mix Design of Self Consolidating Concrete (SCC) with a ***15% minimum requirement*** of a cement substitute of fly ash and/or other pozzalons.

C. Submit Shop Drawings:
   1. Installation Narrative:
      a. Method of transportation.
      b. Method of handling and placement.
   2. Production Drawings:
      a. Elevation view of each unit.
      b. Plan view of unit.
      c. Sections and details to show quantities, sizes and position of reinforcing steel, inserts, and essential embedded hardware for fabrication, handling, transportation and installation.
      d. Section, details and location of specialty lid lifting anchors, caps, and lid lifting system.
      e. Dimensions and finishes.

D. Submit Product Design Data:
   1. Structural adequacy calculations of units (crypts), performed by a licensed Structural Engineer.
   2. Loadings for Design Calculations:
      a. Initial handling and erection stresses.
      b. Dead and live loads specified.
      c. Other loads specified for units as applicable.
      d. Deflection of precast members.
      e. Product test reports:
         1) The concrete shall be tested for the compressive strength and beam flexural strength as specified herein. An approved independent, commercial testing laboratory shall perform tests. Certified copies of test reports, including test data and results shall be submitted to the Architect/Engineer immediately after the strength tests have been completed. The tests shall be as specified herein.
         2) Prior to backfilling over crypts and at contractor expense, the Architect/Engineer may pick a single crypt for coring another bottom slab drainage hole by an independent lab with said core being analyzed (petrography testing) and results submitted verifying evidence of fly ash or other pozzalons as specified.

3) Based on failed testing, the Architect/Engineer may request more frequent testing to ensure quality of the product and pozzalons content is present, again at contractor expense.

3. Manufacturer's Literature and Data:
   a. Each type of anchorage, angle, and fastener.

1.10 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling: Units shall be transported, stored and handled so as to prevent damage to surfaces, edges and corners and to prevent development of stresses and cracks. Provide temporary bracing protection devices and measures as necessary to prevent damage to the units during handling, transportation and storage. Transportation, storage and handling of units without damage is required. Any damage caused by accident or negligence on the Contractor's part shall be corrected at the Contractor's expense. Use the designed crypt lifting wire system to transport crypts. On the job site, forklift handling of crypts may be approved by the Architect/Engineer only following:
   1. Verification that the structural design is adequate.
   2. Verification by the manufacturer and demonstration that the field procedures will cause no crypt damage.
   3. Submission of written safety procedures to be followed so the procedure is maintained as SAFE.

B. Storage:
   1. Units may be stored within crypt fields being constructed on gravel, or at other designated locations(s) on site, as long as they are set on blocking, gravel or other approved methods to prevent damage or plugging of the bottom drainage holes.

C. Markings and Identifications:
   1. Markings, including logos, trademarks and proprietary information are prohibited on surfaces of crypts.
   2. Date of manufacture (month, day, and year) shall be written on the box and lid with permanent ink or an equivalent marking.

1.11 COORDINATION

A. Coordinate the manufacture, delivery, storage and installation of the units with related work.

1.12 WARRANTY

A. After acceptance of work, completed work will be subject to terms of the Manufacturer's general warranty, except warranty period is to extend to five years.

1.13 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

B. American Association of State Highway and Transportation Officials
   T99-01(2019) Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb) Rammer and a 305 mm (12 inch) Drop.

C. American Concrete Institute:
   ACI Manual of Concrete Practice 2011 Edition.
   ACI 318-19 Building Code Requirements for Structural Concrete

D. American Society for Testing and Materials (ASTM):
   A36/A36M-19 Standard Specification for Carbon Structural Steel.
   A153/A153M-16a Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.

A615/A615M-22	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
A1064/A1064M-22	Standard Specifications for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
C31/C31M-22	Standard Practice for Making and Curing Concrete Test Specimens in the Field.
C33/C33M-18	Standard Specification for Concrete Aggregates
C39/C39M-21	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimen
C78/C78M-22	Standard Test Method for Flexural Strength for Concrete (Using Simple Beam with Third-Point Loading)
C150/C150M-22	Standard Specification for Portland Cement.
C172/C172M-17	Standard Practice for Sampling Freshly Mixed Concrete.
C260/C260M-10a(2016)	Standard Specification for Air-Training Admixtures for Concrete.
C494/C494M-19e1	Standard Specification for Chemical Admixtures for Concrete
C595/C595-21	Standard Specification for Blended Hydraulic Cement.
C1116/C1116M-10a(2015)	Standard Specification for Fiber-Reinforced Concrete.
C1157/C1157M-20a	Standard Performance Specification for Hydraulic Cement
C1399/C1399M-10(2015)	Standard Test Methods for Obtaining Residual-Strength of Fiber-Reinforced Concrete.
C1602/C1602M-22	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Precast Concrete: All crypts shall be of concrete with the following:
1. A minimum 28 days compressive strength of 35 MPa (5,000 psi)
2. Self-Consolidating Concrete (SCC) containing structural fiber with an inverted slump between 550 mm and 700 mm (22” and 28”)
3. A minimum of 15% cement substitute of fly ash and/or other pozzalons. Fiber is not required for crypt lids.
4. Hydraulic Cement: ASTM C150 or ASTM C1157 or ASTM C595
5. Normal weight Aggregates: ASTM C33
6. Water: ASTM C1602
7. Chemical Admixtures:
   a. Water reducers, accelerating and retarding: ASTM C494
   b. Air Entraining: ASTM C260
   c. Admixtures with no standard designation shall be used only with approval of VA.
8. Prohibited Admixtures: Calcium Chloride thyocyanates or admixtures containing more than 0.1 percent chloride ions.

B. Reinforcement:
1. Welded Steel Wire Fabric: ASTM A1064.
2. Steel Wire Reinforcement: ASTM A1064.3. Steel Reinforcement: ASTM A615 Grade 60, deformed.
3. Inserts, Anchors, Dowels and Accessories: Steel, ASTM A36, zinc coated ASTM A153 hot-dipped galvanized finish G90.
4. Fiber: Macrofiber complying with ASTM C1116.

C. Form Coatings:
1. Use commercial formulation form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces.

D. Paint:
1. For concrete crypt lid and inside wall surface numbering, use commercial grade, Vinyl Toluidine Modified Alkyd Aerosol Striping Paint specially designed for exterior parking

line striping. Paint shall be tack free in less than ten minutes. Paint as manufactured by Rust-Oleum Corporation or approved equal. Color to be black.

2.2 FABRICATION

A. General:
1. Units shall be fabricated in accordance with the minimum interior dimensions and tolerances indicated herein, with concrete surfaces that are smooth and free of irregularities.

B. Finishes:
1. Surface holes 6 mm (1/4") and smaller caused by air bubbles, normal color variations, normal form joint marks, small chips 6mm (1/4") and smaller and spalling no more than 0.1 square meter (one square foot) total per unit are permitted. Surface holes larger than 6 mm (1/4") caused by air bubbles, normal color variations, normal form joint marks, and chips larger than 6mm (1/4") and spalling greater than 0.1 square meter (one square foot) total per unit are cause for rejection. Honeycombing less than 0.05 square meter (one-half square foot) shall be repaired to the satisfaction of the Architect/Engineer. Honeycombing greater than 0.05 square meters (on-half square foot) is cause for rejection.
2. Exposed steel reinforcing, honeycombing, spalling, bugholes, and cracks not within tolerances are not permitted and are cause for rejection.
3. The lid lifting system shall be as follows:
   a. Top mounted and consist of hot dip galvanized steel anchors (four per lid) each in a 65 mm (2-1/2") diameter minimum recessed bowl of depth sufficient to easily connect lifting device as designated compatible by anchor manufacturer.
   b. Anchors to be installed at locations to ensure maximum lid lifting stability.
   c. A removable plastic cap secured to the anchor which prevents fill material from entering the anchor bowl. Cap to be flush mounted to ensure the entire assembly is not an obstruction for crypt excavating equipment.
4. Concrete shall have no evidence of segregation of materials.

C. Reinforcement:
1. Provide steel and fiber reinforcing as required for casting, handling, erection loads, lateral and overhead fill, and equipment live loads.
2. Reinforcing steel shall be free of dirt, mill scale, rust, oil, grease, ice, snow, water and placed within approved tolerances in accordance with ACI 318. Careful placement of reinforcing is required to avoid overlapping at thin points of the units.

D. Concrete Placement:
1. Porosity, strength, weight and gradation of coarse aggregate shall be as required to produce specified characteristics.
2. Units shall be cast in steel forms designed to suit shape and finish required. Each element of the unit shall be cast as an integral piece free of joints and seams.

E. Curing:
1. 75% of specified concrete compressive strength shall be attained before transportation of units to the cemetery or storage site.
2. Units shall be cured as required to develop specified structural characteristics and shall be stored in a manner that will permit all surfaces to cure equally.
3. Units shall be properly cured in accordance with the applicable provisions of the current ACI Manual of Concrete Practice.

F. Surface Treatment and Corrective Work:
1. Units that have minor chipping of edges and corners shall be repaired by a method approved by the Architect/Engineer.
2. Cracked/damaged units exceeding tolerances shall be removed by the contractor at no cost to the government.

3. Any corrective work beyond what the Architect/Engineer, determines is minor, shall be handled according to written procedures from the Structural Engineer that stamped the design for the units. Otherwise, the units shall be removed and replaced.

2.3 TESTING AND INSPECTION

A. Contractor's Responsibility for Inspection: The Contractor is responsible for the performance of all inspection requirements including:
   1. Removal of lids
   2. Number painting inside crypts
   3. Replacement of the lids for inspection by the Architect/Engineer.
      a. The Architect/Engineer reserves the right to perform any of the inspections set forth in the specification when deemed necessary to assure that the units conform to prescribed requirements.

PART 3 – EXECUTION

3.1 CRYPT FIELD QUALITY ASSURANCE

A. Testing: The contractor shall procure an independent qualified testing agency to perform concrete tests during crypt production and prepare test reports.
   1. Concrete Cylinder testing for compressive strength:
      a. Three cylinders per day of crypt production to be taken in accordance to ASTM C172 as applicable to SCC.
      b. Strength to exceed 35 MPa (5000 psi) after 28 days curing in accordance to ASTM C31 & C39.
      c. Test inverted slump when cylinders are made.
   2. Beam testing to confirm design flexure strength:
      a. Once at the beginning of crypt production, a minimum of three beams with fiber shall be taken for testing of Flexural Performance of Fiber-Reinforced Concrete in accordance with ASTM C78 and C1399. All beams' flexural strength shall exceed the crypt design flexural strength requirements and residual strength of fiber reinforced concrete, and shall exceed capacity of conventionally reinforced concrete wall design as submitted by the Structural Engineer and approved by VA. Fiber Manufacturer shall verify type and dosage rate of the test beams are identical in crypt production.
   3. A single verification test of fly ash in the crypt concrete mix required at the discretion of the Architect/Engineer.

3.2 GENERAL LAYOUT CONTROL

A. A professional registered Land Surveyor shall establish sufficient lines, grades and control for the horizontal placement, slope of the base and top, and vertical alignment for the sides of units in accordance with the design drawings.

B. Surveyor shall provide a "Record Survey", 1-inch= 10 feet, drawings of the final installed vault layout and adjacent road:
   1. Record survey to be on State Plane Coordinate System and include Surveyor seal and notations per State of GA & Baldwin Co. Surveying requirements.
   2. Provide 3-sets of prints.
   3. Provide electronic file (AutoCAD 2013 or later).
   4. Create and Register Plat drawings with Baldwin County offices (per County requirements) and pay registration fee (copy Architect and Owner with drawings and receipt of registration).

3.3 PREPARATION

A. Before beginning installation, inspect work of other trades insofar as it affects the work of this section. Commencing installation of units will be construed as accepting as suitable the work of other trades.

B. Verify by survey, rough grading of aggregate for first row of crypts to be installed in a field. **Provide a certification by the professional surveyor** to the Architect/Engineer that the rough grading for the base stone for the first row of crypts to be installed, as well as that the survey control points for crypt setting have been set according to the plans, prior to the Contractor starting to set crypts in the field. The Surveyor shall indicate to the Architect/Owner where the control points are located and how they are protected.

C. Verify by testing, compaction of prepared subgrade and subbase to meet Modified Proctor (ASTM D1557).

D. Verify by survey locations and elevations of units relative to control points indicated on plans. Submit new control point layout if a crypt size other than specified is used.

3.4 HANDLING, INSTALLATION AND PAINTING

A. Handling:
1. Units shall be handled in a vertical plane at all times and stacked vertically on wood supports of adequate strength, or placed on gravel until erected. Use of approved designed OEM lifting cable system that has been deemed to be safe for handling the units shall be used during the setting process, where workers are nearby.
2. Lift units with suitable lifting devices at points provided by manufacturer.
3. Provide temporary wood bracing to comply with manufacturer's recommendations to keep crypt bottom off ground during storage.

B. Installation and Painting:
1. Install units by competent erector crews trained and certified as competent by units manufacturer.
2. Refer to grading plans and crypt installation details. Surveyor shall fully understand that the crypt is placed on a sloped subgrade, and that the plot lines established on the finish grade will not be in the same location at the bottom of the crypt (on the crypt subbase).
3. Use all means necessary to protect units from being damaged in transport and during and after installation. Lids or other parts of the crypt that show damage from bouncing during transport shall be replaced by the contractor at no cost to the Owner.
4. Accurately install by aligning and leveling units in accordance with plans. Assure that crypts are in straight horizontal alignment.
5. After crypt installation and prior to backfill, remove lids with the specified lifting apparatus for crypt inspection by the Architect/Engineer inspector and numbering. Numbers furnished by NCA shall be painted on the outside of the crypt lids and on the upper inside crypt short wall, both at the headstone end. Numbers may be hand-painted if deemed legible by the Architect/Engineer. Otherwise, stencils shall be utilized. Numbers shall be permanent paint as specified and approximately six inches high (if stenciled) or twelve inches high (if hand painted). Crypt lid number painting must be applied to a clean, dust-free surface requiring paint application **within 10 seconds** of surface cleaning. After completion of inspection and marking, the Contractor shall replace the lids. Any damage to lids or crypts will be the responsibility of the contractor. See Part 3.9.I.D. Tag Installation for identifications.

3.5 PROTECTION OF WORK

A. Use all means necessary to protect units from being damaged during and after installation.

3.6 REPLACEMENT AND REPAIR

A. Remove and replace units that the Architect/Engineer has determined are damaged, cracked beyond tolerances, broken, improperly fabricated, or otherwise defective and are structurally unsound and unacceptable.

B. Units having minor defects not affecting serviceability or appearance may be repaired when approved by the Architect/Engineer.

C. Proposed repair work shall be sound, permanent, and flush with adjacent surfaces and submitted for approval by the Architect/Engineer.

D. Replacements and repairs shall be done at no additional cost to the Government.

3.7 BACKFILLING AND CRYPT FIELD PROTECTION

A. Prior to the backfill being placed between the crypts, a professional registered Land Surveyor shall:
   1. Survey the in-place crypts and provide a written certification that they are, within allowable tolerances installed:
      a. At the design locations
      b. Properly aligned
      c. At correct elevations and slopes

B. The following documents shall be provided to the Architect/Engineer:
   1. An electronic drawing of the as-built conditions for the installed crypts.
   2. A paper copy at appropriate scale so the crypt field is fully shown on a maximum sheet size of 600 mm x 900 mm (24" x 36") with all indications of variances in the placement from the design drawings shown.
   3. A written certification that during the manufacturing, handling, setting, and or crypt numbering process that each of the lifting bowls were operated using the designed lifting device, and that any excessive concrete debris has been removed to allow free operation of the lifting bowls. A description of when in the process each of the lifting bowls were used shall also be provided.

C. When all of the crypts in a specific field are installed as indicated in the design drawings and details, and the surveyor has so certified, the Architect/Engineer will approve the Contractor proceeding with the backfill between the crypts. The Contractor is responsible for insuring that the crypts do not move during the backfill operations, including but not limited to providing adequate blocking at the base of the units, if deemed necessary, to prevent them from moving during the backfill operations.

D. Protect installed crypt units during backfill operations.

E. Install approved backfill against outside walls of all units, insuring no voids are remaining. Approved backfill shall:
   1. Contain no materials that will cause a concentrated point load.
   2. The perimeter wall backfill shall be compacted to Modified Proctor (ASTM D1557). Compaction shall be 92% - 96% except for compaction within the top 16" of finish grade. Top 16" of soil shall be compacted 80% to 85%.
   3. Shall be compacted without using large vibratory equipment near crypts as impact loading may cause damage or failure of the crypt.

F. Backfill between the crypts where gap is less than 50mm (2-inches) shall be as follows:
   1. Install approved (rounded) gravel that meets the specified gradation into gaps between crypts leaving no voids.
      a. At Architect/Engineer's discretion, a non-rounded stone may be considered as a substitute for the rounded stone. The Architect/Engineer may accept the (non-rounded) stone only following demonstration, through an approved submittal process, that rounded stone is not available for less than 4 times the cost of a cut/crushed angular (non-rounded) aggregate substitute. Largest size for the non-rounded stones shall not exceed the gradation size for the rounded stones. (A smaller gradation size will be required for the non-rounded stones to insure that the stones are not larger that their rounded counterparts.)The non-rounded stone shall only be considered when with the largest size of the stone passing a sieve size does not exceed the allowable stone size for the rounded stone gradations. The non-rounded stone may be approved when the size is as described above, and with a successful demonstration that filling gaps between crypts leaves no voids,

because the stones fall into place without bridging as should occur when using rounded stones.

2. Use rodding to assure no bridging occurs and void areas are eliminated.
3. No sand allowed.
4. As a resource saving measure, the use of angular stone of suitable gradation (typically the same stone used as drainage stone for below the crypts) shall be allowed in the space between the head and foot of the crypts only, if the Contractor demonstrates a successful method of placement that prevents the larger angular stone from spreading into the gaps along the long sides of side by side crypts.

Aggregate Size No.	Grading Requirements - Amounts finer than Each Sieve (Square Openings), Mass Percent					
	12.5 mm (1/2")	**9.5 mm (3/8")**	**4.75 mm (No. 4)**	**8.36 mm (No. 8)**	**1.18 mm (No. 16)**	**300 □ (No.50)**
8	100	85 to 100	10 to 30	0 to 10	0 to 5	
89	100	90 to 100	20 to 55	5 to 30	0 to 10	0 to 5

G. Install backfill on top of units and compact. Backfill shall be as shown on plans. In absence of plan detail, backfill on top of units working from bottom up consists of 75 mm (3 inches) of identification sand, soil to specified level, and 100 mm (4 inches) minimum of topsoil as the final layer (Drawing details take precedent for depth of topsoil). The entire backfill atop units shall be compacted to 85% density (Standard Proctor ASTM D698).

H. No equipment over the crypts should exceed crypt design loads as specified herein 5500 kg (12,000 lbs axle), which includes compacting equipment. No vibratory compaction equipment over or alongside crypts unless impact loads are shown not to exceed crypt design loads.

I. Immediately during crypts install, mark the crypt field edges with temporary driven 5-foot-tall lathes & signage for easy identification by vehicles carrying fill, topsoil, compost, sod, water or other. Signage shall state ***"5500-kg axle load maximum. Keep 9 m away"***(***"12,000-lb axle load maximum. Keep 10 yards away")*** and placed minimum 15 m (50-ft) apart.

J. Lathes & signage to be maintained in-place during backfilling thru final acceptance of the crypt field.

K. Finish grading and prepare topsoil as indicated on plans.

L. Do not store or stockpile any stone, sand, backfill, crypts or any other material over 1200 mm (4-feet) high within 9 m (10 yards) of ground on top of installed crypts. Affected crypts subject to said loading condition as determined by the Architect/Engineer shall be inspected for possible damages with all excavation, lid lifting, fill replacement and all other work as necessary, all at contractor's expense.

M. Do not allow any vehicle that exceeds a 5500 kg (12,000-lb) axle load, 2700 kg (6000-lb) wheel load or equivalent pressure per square inch to traverse or park within 9 m (10 yards) of or on top of installed crypts. Affected crypts subject to said loading condition as determined by the Architect/Engineer shall be inspected for possible damages with all excavation, lid lifting, fill replacement and all other work as necessary, all at contractor's expense.

3.8 INSPECTION AND ACCEPTANCE

A. Final inspection and acceptance will be by Architect/Engineer following receipt of:
1. Recommendations from A/E team as applicable.
2. Electronic DWG files of each individual crypt field, with coordinates of the monument markers indicated, and each burial plot being indicated with a closed polygon, and

corresponding NCA burial plot identification number, along with the section markers and number for the section.

3.9 I.D. TAG INSTALLATION

A. Install Stainless Steel – 1-1/2" W. x 3"L. x 1/16", type 304 (punched for wire and anchors) Die stamped tag with SS concrete anchors:
   1. Die stamp vault number on I.D. Tags – 2 per vault.
   2. Drill anchors to attach tag to top (head) of vault lid (2 anchors each tag).
   3. Drill anchor outside top of head wall of vault to anchor wire tied tag placed inside vault for verification: 2" from top of vault.
   4. Columbaria Niches - Place (1) tag on back wall of each Niche.

B. Wire and Anchors:
   1. Stainless Steel Masonry anchors drilled into concrete vault lid top head wall of vault exterior & insert wired tag inside vault.
   2. Stainless Steel Wire: Non-corrosive material, 14-gauge.

END OF SECTION

DIVISION 3 – CONCRETE
SECTION 03 48 24 – PRECAST CONCRETE COLUMBARIUM UNITS

PART 1 – GENERAL

1.1 SUMMARY

A. This section covers the manufacture and installation of precast concrete columbarium units, as shown on the drawings and specified herein, including but not limited to: the steel reinforcement, steel embedment plates, required sleeves, finished exposed surfaces, preparation of setting surface, adhesive, columbarium fasteners, and niche cover anchor clip assemblies.
   1. Includes associated subbase foundation, drainage, and placement of unit.
   2. Installation of VA/Using Agency furnished Granite niche covers.
   3. Granite cap and end wall panels are in Section 04 86 00 “Stone Masonry – Granite”.

B. Acceptable designs of the columbarium units' components are provided as shown on the Drawings. The Contractor may use this design for this Work or may propose alternate designs of the corresponding components as follows:
   1. Design for alternate columbarium units shall comply with the design criteria as per Articles 1.3.F and shall comply with the functional tests as per Article 1.3.G of this Specification.
   2. Unless indicated otherwise, all provisions of this Specification shall apply to the Contractor proposed design.

C. The Government and Owner may accept or reject part or all of any design proposed by the Contractor. The cost of the design will be paid for by the Contractor.

D. This section includes preparation, cleaning and finishing of exposed faces of the columbarium units as indicated on drawings or described herein.

1.2 RELATED DOCUMENTS

A. Section 01 33 00 “Submittals”.

B. Section 03 30 00 “Cast-In-Place Concrete”

C. Section 04 86 00 “Stone Masonry – Granite”.

D. Section 04 73 00 “Columbarium Niche Covers”.

E. Section 07 92 00 “Joint Sealants & Gasketing” for workmanship of joint sealant application.

F. Section 31 20 00 “Earth Moving”.

1.3 QUALITY ASSURANCE

A. Manufacturer’s and Installer’s Qualifications: Prior to commencement of work, submit documentation regarding the experience of his precast concrete supplier and his precast concrete installer in the design, manufacture and installation of Precast Concrete structures and custom units.

B. Precast concrete manufacturer’s qualified Registered Professional Structural Engineer to certify that precast reinforced concrete conforms to specified requirements.

C. Codes and regulations of the Federal, State and County authorities shall apply.

D. Fabricate to dimensions shown or approved. Replace or correct Columbarium Units that do not comply with the individual dimensions and tolerances.

E. Before starting production of Precast Concrete Columbarium Units, furnish at the site, one complete unit of the full Precast Concrete Columbarium Units, to demonstrate quality of construction. Commence production of columbarium units only after written approval has been obtained from the Architect/Engineer.

F. Design Criteria:
1. The Columbarium Units shall be of the following type, style, and size:
a. Type: Precast concrete, reinforced.
b. Size: Interior and exterior dimensions as indicated on plans.
2. Columbarium top shall be capable of structurally supporting imposed service live load of no less than 240 Kgs./Square Meter (50 lb./ ft²), and dead loads based on cap (coping) thickness and heights, including material composition and element section properties, mortar and grout, and dead loads based on concrete top element sectional properties.
3. Submit to the Architect/Engineer for review and approval (2) sets of design documentation showing structural design of the complete Columbarium. This documentation shall include dimensions, methods of construction, and calculations. All design calculations and drawings shall be signed and sealed by qualified Professional Structural Engineer licensed in the state of the project location.

G. Functional Load Tests: If required by the Architect/Engineer, a functional load test will be made at the Contractor's expense to ensure that the columbarium proposed by the Contractor, as furnished, will be capable of supporting loads stated in Article 1.3.F.2. The functional test will consist of the following loading conditions:
1. Unconfined Loading: The columbarium will be placed on a flat surface with no support against the sides. The entire top of the columbarium will be subjected to a simulated uniform load of live load of 240 Kgs./Square Meter (50 lb./ft²) and required dead load simulating cap, mortar, and grout as they will be installed. The load will be maintained for no less than 72 hours. At end of the loading period, the maximum deflection of the Columbarium top elements shall be no more than 3 mm (1/8"). Upon removal of the load from the unit the residual deflection shall be no more than 1.5 mm (1/16") and concrete elements shall be free of all structural distress.

1.4 MANUFACTURER QUALIFICATIONS

A. Precast concrete columbarium units shall be a product of the manufacturer who has a minimum of 3 years of experience in fabrication of the precast concrete columbarium units similar in material, design, and quantity to that indicated on the drawings and specified herein. Current plant certification for the location(s) that will be producing the units for this project from the National Precast Concrete Association (NPCA) shall be provided as a submittal prior to any work being performed.

B. Manufacturer's that have successful experience fabricating precast concrete niche units for cemeteries outside of NCA, may be selected by the Contractor. Contractor is hereby notified that the submittal process for a manufacturer with no previous NCA experience shall require additional submittal review time.

C. Supply and Installation of fastener system shall be by product manufacturers and installers, both whom have had a minimum of 3 years of experience in installation of similar design to that indicated on the drawing. Supply and installation shall be by the same entity.

1.5 INSTALLER QUALIFICATIONS

A. Precast concrete columbarium unit installer shall have been regularly engaged for at least three years in installation of precast concrete similar to this project. Installers that have previously completed at least three successful NCA columbarium projects within the past 10 years are deemed to be acceptable. Installer to submit successful projects for NCA review. Installer to submit resumes with names of those experienced installers performing the installation.

B. Installer shall have had a minimum of 3 years of experience in installation of niche cover attachment hardware.

1.6 ALLOWABLE TOLERANCES

A. In addition to tolerances of individual elements required by American Concrete Institute Publication 533.3R, erection tolerances shall be as follows:
   1. Variation of anchors and fasteners from dimensions specified: 1.5 mm (1/16”)
   2. Variation in height and width of individual precast unit: 3 mm (1/8”)
   3. Variation in overall dimension of set precast units and joints within columbarium wall (height and width): 3 mm (1/8”)
   4. Maximum joint variance between adjacent units in erected position: 3 mm (1/8”)
   5. Variation in thickness of precast elements: 3 mm (1/8”)
   6. Maximum vertical difference between adjacent columbarium units in installed position: 3 mm (1/8")

1.7 SUBMITTALS

A. In accordance with Section 01 33 00 “Submittals” furnish the following:
   1. Samples of all fastening systems, mounting hardware and exposed surface finishes including, but not limited to, the following:
      a. Stainless Steel Angle with threaded spring clip to receive the Tamper-Proof Stainless-Steel Bolt
      b. Stainless Steel Bolt, Nut and Washers
      c. Tamper-Proof Stainless-Steel Bolt
      d. Stainless Steel Rosette
      e. Stainless Steel Expansion Anchors, Bolts and pins
      f. Stainless Steel Ferrule loop insert.
      g. Shims
      h. Washers
   2. Samples of two complete Precast Concrete Columbarium Units, to demonstrate quality of construction, delivered to the site to be approved prior to production.
   3. Samples of adhesives and grouts.
   4. Samples of concrete repair and/or patching materials.
   5. Shop Drawings: Complete shop and erection drawings of all precast concrete columbarium units, showing:
      a. All dimensions and details of construction.
      b. Installation and relation to adjoining work.
         1) Show that the overall length of the wall, with multiple precast units is to be set with the indicated overall in place length, within the allowable tolerances (show the installation tolerances).
         2) For back-to-back precast niche units show that the web centerlines for the back-to-back units align. The locations of the cap vertical joints shall be centered on the niche web centerlines, within the allowable tolerances.
         3) Detail where the precast niche units are to be set in the field so the centerline of niche webs will align with the centerline of cap joints above, within the allowable tolerances, when the drawings or details indicate this alignment.
      c. Reinforcements, anchorage, attachments, inserts, location of all pre-drilled sleeves and other items to be installed in the work of other trades.
      d. Joint treatment, joint alignment coordinated with cap stone joints.
      e. Any other work required for a complete installation.
      f. Provide evidence, such as meeting minutes, that the Contractor to be installing the cast-in-place concrete foundations for the columbarium niche units and piers has been contacted prior to any work relating to the footings for the columbarium construction, and that the construction of the concrete support (foundations) work has been coordinated with the precast columbarium unit manufacturer and installer prior to pouring of concrete foundations.
   6. Production Drawings:
      a. Elevation view of each structural element.
      b. Plan view of unit.

c. Sections and details to show quantities and position of reinforcing steel, anchors, inserts, and essential embedded and non-embedded hardware for fabrication, handling, transportation, and installation.
d. Lifting and erection inserts.
e. Dimensions and finishes.
f. Method of transportation.
g. Method of erection and handling.

7. Erection Drawings:
   a. Elevation view of each typical wall segment of interconnected precast niche units, with the overall in place length and position of the precast niche assembly.
   b. Section view of the precast niche units, as they are to be installed, with the critical alignment elements and field placed dimensions indicated. For double sided units, as an example, the face of niche unit to face of backed up niche unit shall be indicated with the construction tolerances for the in-place units indicated. Clearly indicate how the units are going to be set in the field to achieve the intended installed conditions.
   c. Provide setting drawing(s) that indicate how the precast niche units are to be positioned on the foundations, to meet the design drawings. The setting drawings shall be submitted based upon the field conditions for the foundations for the segments upon which the precast niche units are to be set. Any discrepancies that exist greater than 1/4" from the design drawings shall be clearly indicated as the foundations are to be constructed within this tolerance. The setting of the precast concrete niche units shall not begin until this information has been provided and approved by the Architect/Engineer, or adjustments made to the foundations that are acceptable to the Architect/Engineer.
   d. Provide coordination drawings indicating the locations for the weld plates in the precast niche units as well as in the foundations. Coordinate this information so the weld plates are installed in the correct locations to align within allowable tolerances.
8. Manufacturer's Literature and Data:
   a. Each type of Concrete Fastener, including adhesive and anchor devices.
   b. Instructions for final cleaning.
   c. Written instructions of how the exposed-to-view concrete of the precast niche units is to be cleaned and prepared prior to application of the approved stain/coating indicated above.
9. Certificates: Current plant certification for the location(s) that will be producing precast concrete units for this project from the National Precast Concrete Association (NPCA).
10. Certificates: Installer's qualifications documenting the quality and quantity of experience of the precast concrete installer in the installation of precast concrete structures and custom units.
11. Certificates: Manufacturer of the precast niche units shall provide a written certification, prior to shipping the materials, that the products being shipped have been checked and that they meet the dimensional criteria as indicated, within the allowable tolerances for individual units, and that they can be assembled as part of the identified wall segments, within the allowable in place dimensions indicated, within the allowable tolerances indicated. The above manufacturing certifications shall be provided no later than immediately before the units are offloaded at the site. Units that do not meet these criteria shall either be returned or marked in such a manner that indicates they are not to be used for the project work. It is the Contractor's responsibility to ensure that all units that are installed in the project work have been certified by the manufacturer of the units. The Contractor shall be responsible for disposal of any units that are not acceptable for installation in the project work at no cost to the Government.

1.8 DELIVERY, STORAGE

A. Ship precast concrete columbarium units to site with adequate protection to prevent chipping, breaking and other damage. Materials shall be marked giving proper identifications and location. Store materials in protected areas to prevent damage including vandalism, injurious effects of weather and inclusion of foreign matter.

B. Provide access to the units for field verification of the manufacturing dimensions and whether the units are within allowable tolerances.

1.9 COORDINATION

A. Coordinate the manufacture and erection of precast concrete columbarium units with related work of other sections of the Specifications. Provide templates for inserts and other devices for anchoring precast concrete columbarium units to the work of other trades, in sufficient time to be built into adjoining construction. Perform cutting, fitting and other related work in connection with erection of precast concrete columbarium unit work. See Section 01 33 00 “Submittals” for details regarding the coordination of work.

B. Provide Contractor with foundation support layout drawings for cast-in-place concrete base pads. (Rubbed smooth Concrete finish)

1.10 GUARANTEE

A. Guarantee precast concrete columbarium unit work, including anchorage, joint treatment and related components to be free from all defects in materials and workmanship, including cracking and spalling, and after erection, for a period of not less than (2) years.

1.11 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

B. NPCA National Precast Concrete Association

C. American Society for Testing Materials (ASTM) Standards:

A36/A36M-19	Carbon Structural Steel.
A615/A615M-12	Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
A1064/A1064M-18a	Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
C33/C33M-18	Concrete Aggregates.
C150/C150M-22	Portland Cement.
C920-18	Elastomeric Joint Sealants

D. American Welding Society (AWS) Publications:

AWS D1.1/D1.1M:2020	Structural Welding Code - Steel
AWS D1.4/D1.4M:2011	Structural Welding Code - Reinforcing Steel

PART 2 - PRODUCTS

2.1 FABRICATORS

A. Available Fabricators: Subject to compliance with requirements, and BABAA requirements, fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Wilbert Cemetery Construction.
2. Lindsay Precast
3. Koppenberg Enterprises, Inc.

2.2 CONCRETE MATERIALS

A. Coarse Aggregate: Hard durable aggregate carefully graded from coarse to fine in proportions required to match approved samples of precast concrete columbarium units.

B. Aggregate For Back-Up Mix (Fine and Coarse Aggregate Lightweight): ASTM C33/C33M-18. Limit gradation as required to produce the specified appearance and quality of concrete.

C. Portland Cement: ASTM C150/C150M-12, Type I and Type II; Color as required.

2.3 REINFORCING MATERIALS

A. Structural Steel: ASTM A36/A36M-19.

B. Steel Fabric Reinforcement: ASTM A1064/A1064M-18a, galvanized.

C. Steel Wire Reinforcement: ASTM A1064, cold drawn.

D. Reinforcing Steel: ASTM A615/A615-M12, deformed, Grade 60.

E. Miscellaneous Galvanized Steel Items: Bolts, nuts, washers, anchors, inserts, and the like for handling, erection, or use by trades.

2.4 NICHE COVER ATTACHMENT HARDWARE (ROSETTES)

A. VA National Cemetery Administration, standard stainless-steel rosette, mounting brackets, and bolts for complete attachment of the niche covers to the precast columbarium units are to be as shown on drawings:
   1. Rosettes
      a. ASTM Type 316 stainless steel sheet goods, 2.7 mm (0.100 inch) thick.
      b. Die stamp, producing an eight-petal flower pattern as shown on drawings, 25 mm (one-inch) diameter with slight convex; center hole of 5.5 mm (0.218"), concentric to outer edge, with shoulder recess of 10 mm(0.400") in diameter and 1mm (0.035") in depth.
      c. Luster finish.
   2. Interior mounting and attachment elements:
      a. ASTM Type 316 stainless steel tamper-resistant bolts, nuts, washers, anchors, mounting brackets, inserts and the like.

2.5 JOINT BACK-UP MATERIAL

A. Closed cell neoprene, butyl, polyurethane, vinyl or polyethylene foam rod, diameter approximately 1-1/3 times the joint width.

2.6 BOND BREAKERS

A. Type and material recommended by sealant manufacturer.

2.7 JOINT SEALANTS

A. Elastomeric, single-component, non-staining silicone sealant, meeting requirements of ASTM C 920, Type S, Grade NS, Class 25 or higher. Color to match ultimate finish of vertical precast web unit face.

2.8 FABRICATION

A. Precast concrete columbarium units shall NOT be: fabricated, delivered or incorporated in the work until samples have been approved. Adhere to National Precast Concrete Association (NPCA) standards for fabrication, handling, and erection. Tolerances shall be as indicated herein.
   1. Concrete for precast columbarium units shall have minimum compressive strength of 35 MPa (5,000 psi) at 28 days.
   2. Provide additional steel reinforcing as required for casting, handling and erection loads. Adhere to American Welding Society (AWS) Publications AWS D1.1/D1.1M:2020 and AWS D1.4/D1.4M:2011 for structural welding codes and requirements.
   3. Back-up Mix: Porosity, strength, weight and gradation of coarse aggregate shall be as required to produce specified characteristics.
   4. Columbarium units shall be cast in steel forms designed to suit shape and finish required and to withstand high frequency vibration. Concrete shall be deposited in oiled forms.

Form oil shall be non-staining type. Vibrations, where required, shall be continuous during process of casting to attain through compaction, complete embedment of reinforcement and to assure concrete of uniform and maximum density without segregation of mix and full thickness of precast element is attained.

a. Anchors, lifting devices, provisions for cutouts and openings, notches, inserts and similar items required for the work of other trades shall be accurately positioned in forms before casting elements.

b. Fastener location holes, including those for anchoring of units and attachment of niche covers, shall be cast into units. Drilling into precast concrete columbarium units, after fabrication, shall not be acceptable, except where pins are to be inserted through the tops of the units into the caps above, or where pins are to be inserted through the bottom of the precast niche units into the foundation below. Pin hole locations shall be to the sides of niche and shall not be centered in the niche.

5. Cement, aggregate and water shall be obtained from single sources for facing mix of precast concrete work in order to assure regularity of appearance and uniformity of color.

6. Finish: Exposed faces shall have smooth natural concrete finish, unless otherwise noted. Following removal from the forms but before shipping to the site, the manufacturer shall process and clean the face of the units of all debris and form oil to ensure that the discoloration and blemishes on the niche faces are removed. The entire surface of the niche faces shall then receive an evenly applied smooth rubbed finish before shipping to the site. Units that arrive at the site with blemishes and discoloration are subject to rejection.

7. Curing: Precast concrete shall be cured as required to develop specified structural characteristics and shall be stored in a manner that will permit all surfaces to cure equally and minimize warping, without staining the exposed faces.

2.9 NICHE FACE COATING

A. All exposed to view faces and edges of columbarium niches shall receive approved coating as noted herein. Basis of Design for coating shall be MasterProtect® HB 300 SB Waterborne, high-build, modified acrylic water proof coating manufactured by Master Builders Solutions Construction Systems US, LLC, or approved equal. The application procedures for the niche face coating shall achieve the manufacturer required coating thickness as is indicated on a properly primed substrate as required for Warranty applications of the product (8-10 dry mils). If two coats of high-build, modified acrylic water proof coating are not provided, one coat of primer (basis of design MasterProtect® FL 749) is required followed by one coat of high-build, modified acrylic water proof coating, with the applications resulting in the required coating thickness per the manufacturer's recommendations (8-10 dry mils). Primer shall be a different color than the final coat. Color of niche face coating to be determined during columbarium mock-up review.

PART 3 – EXECUTION

3.1 HANDLING AND INSTALLATION

A. Before beginning installation, inspect work of other trades in-so-far as it affects the work of this Section. Install units by competent installation crews meeting the requirements of paragraph 1.4

B. Commencing installation of precast concrete columbarium units will be construed as acceptance, as suitable, of such work of other trades. Concrete base for the columbarium units shall be inspected and modified as required, grinding off high spots, to become an acceptable base upon which to install the units. Columbarium units shall be handled in a nearly vertical plane at all times and stacked vertically on wood supports of adequate strength, until erected. Cover and protect precast concrete columbarium units against staining and other damage. Reinstall, realign and otherwise correct improperly installed units.

1. Accurately place and securely anchor precast concrete columbarium units to adjoining construction in accordance with approved shop and erection drawings.

3.2 SETTING

A. Each precast element shall be set level and true to line with uniform joints as specified within the allowable tolerances, and as needed to result in the overall length of the wall assembly being the specified dimension, within the allowable construction tolerances. Joints that are required to have sealants shall be kept free of dirt and other contaminants for at least the depth to the contact points of the backer rod. Precautions shall be taken to protect precast concrete work from being damaged and soiled during and after installation. Wedges, spacers or other appliances which are likely to cause staining shall be removed from joints.

B. Setting of the precast niche units is intended to meet the design drawings within the allowable construction tolerances indicated. There are certain visual relationships that are most critical in the final installation to achieve the design intent. Generally, the consistency of the cap overhang in front of the precast niches, as well as the symmetry of the overhang distance are critical. For double-sided columbarium niche units, as an example, the distance from the face of niche unit to the face of niche units, when installed back-to-back, is a critical dimension when setting the units. Maintaining this dimension in setting the units, especially at the top of the precast niche units, will allow the caps to be manufactured the same width, and the placement should produce the correct overhang and be symmetrical. The distance from the center of vertical webs on adjoining units are critical as maintaining these allows the proper setting of the niche covers.

3.3 SEALING OF JOINTS

A. Joints between precast concrete columbarium niche units and between other precast elements and adjoining masonry, concrete and other materials shall be filled with bond breaking material for depth extending as required to form joint of depth as shown or recommended by sealant manufacturer. Provide bond breaking tape, at base of sealant where space for bond breaking materials do not exist and to prevent sealant from bonding to material at base of joint to avoid three-sided sealant adhesion failures.

1. Workmanship shall be in accordance with Division 1 Specification Sections and Section 07 92 00 “Joint Sealants & Gasketing” except as indicated below.
2. All joints shall be mechanically cleaned and primed with the sealant manufacturer's recommended joint primer, immediately prior to placing the joint sealant.
3. Contractor shall use painter’s tape during the completion of critical (highly visible) joints to receive sealant to produce a consistent thickness and appearance.
4. Joint sealant process shall be undertaken only when there is no contaminants (such as dirt and dust) in the air. Joints must be protected from contamination until the sealant will no longer be permanently discolored by dirt, dust or debris that sticks to the surface of the sealant before it dries.

3.4 CLEANING

A. After erection is complete, clean precast columbarium units using materials, equipment and methods recommended by manufacturer.

3.5 REPLACEMENT AND REPAIR

A. Precast concrete columbarium units which are damaged, cracked, stained, improperly fabricated, have exposed reinforcing, or otherwise defective shall be removed and replaced at no additional cost to the Government. Precast units having minor defects not affecting serviceability, structural integrity of niche cover anchoring system, may be repaired when approved by the COR. Minor defects on exposed to view units shall be repaired. Repaired work shall be sound, permanent, smooth, and flush with adjacent surfaces and of color and texture matching similar adjoining surfaces and shall show no line of demarcation between original and patched surfaces. Replacement and repairs shall be done at no additional cost to the Government.

3.6 APPLYING NICHE FACE COATING

A. Apply specified niche face coating to the entire front face of properly prepared precast concrete niche units (complete), per manufacturer's standard specifications and recommendations.

3.7 INSTALLATION OF GRANITE NICHE COVERS

A. Install niche covers plumb and level as shown so that exposed faces of niche covers lie in the same plane and that rows of niche covers align both horizontally and vertically. Tighten fasteners to achieve snug fit but do not over-tighten to the point where they may crack or break niche co-vers.

3.8 INSPECTION AND ACCEPTANCE

A. Final inspection and acceptance will be by the Architect & Cemetery Director.

END OF SECTION

DIVISION 4 – MASONRY
SECTION 04 20 00 – UNIT MASONRY

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Concrete Masonry Units (CMU)
   2. Mortar & Accessories.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 07 92 00 “Joint Sealants & Gasketing" for sealing joints.

C. Products installed but not furnished under this Section include the following:
   0. Section 05 50 00 “Metal Fabrications” Steel lintels for unit masonry specified in
   2. Section 08 11 13 “Hollow Metal Doors and Frames”. Hollow metal frames in unit masonry openings

1.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm) at 28 days.
   1. For Concrete Unit Masonry: As follows, based on net area: f'm = 2000 psi (13.8 MPa), unless noted otherwise.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to Section 01 33 00 “Submittals”.

B. Product data for each different masonry unit, accessory, and other manufactured product specified.

C. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.

D. Samples for verification of the following:
   1. Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
   2. Masonry mortar samples required showing the full range of color expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on the Project. Label samples to indicate type and amount of materials used.

E. Material certificates for the following, signed by manufacturer and Contractor, certifying that each material complies with requirements.
   1. Each different cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
   2. Each material and grade indicated for reinforcing bars.

F. Material test reports from a qualified independent testing agency, employed and paid by Contractor or manufacturer, indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:
   1. Mortar complying with property requirements of ASTM C 270.
   2. Grout mixes. Include description of type and proportions of grout ingredients.
   3. Masonry units.

G. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.4 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of

assemblies with fire resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

B. Single-Source Responsibility for Masonry Units and Mortar: Obtain exposed masonry units and mortar of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.

C. Mockup: Prior to installing unit masonry, construct sample wall panels to verify selections made under sample submittals and to demonstrate aesthetic effects of materials and execution. Build mockups comply with the following requirements, using materials indicated for final unit of Work.
1. Locate mockups on site in the locations as directed by Architect.
2. Build mockups for the following types of masonry in sizes approximately 48 inches long by 48 inches high by full thickness, including face and accessories. Include a sealant-filled joint at least 16 inches long in each mockup.
   a. Each type of exposed unit masonry brick construction.
3. Clean exposed faces of mockups with masonry cleaner indicated.
4. Notify Architect one week in advance of the dates and times when mockups will be constructed.
5. Retain, protect, and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   a. Acceptance of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
   b. Acceptance of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
   c. When directed, demolish and remove mockups from Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

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

B. Store cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

A. 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.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and mortar splatter by 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.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or

frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:

1. Cold-Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures:
   a. 40 to 32 deg F (4 to 0 deg C): Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C).
   b. 32 to 25 deg F (0 to -4 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry.
   c. 25 deg F (-7 deg C) and Below: Work not permitted.
2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:
   a. 40 to 25 deg F (4 to -4 deg C): Cover masonry with a weather-resistant membrane for 48 hours after construction.
   b. 25 to 20 deg F (-4 to -7 deg C): Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi./h (25 km/h).
   c. 20 deg F (-7 deg C) and Below: Provide enclosure and heat to maintain temp above 32 deg F (0 deg C) within the enclosure for 48 hours after construction.
3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

D. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and above.

1.7 WARRANTY

A. Warranty shall be for one (1) year afer date of purchase. Liability shall be limited to replacement of defective product or refund of purchaser's price.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Portland Cement, Mortar Cement, Masonry Cement, and Lime Colored Mortar
   a. Lehigh Portland Cement Co.
   b. Acceptable Manufacturers are subject to compliance with specified requirements and BABAA compliance.
2. Masonry Units:
   a. Augusta Concrete Block.
   b. Metromont.
   c. Dillon – Architectural Concrete Masonry Units
3. Sill:
   a. Echelon masonry – Cordova series.
      1) 8" High Window Sill (WS) - #4824WS.
      2) Face to be determined by Architect from complete catalog.

2.2 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required.
1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
2. Provide square-edged veneer units for outside corners with 8" return face, except exposed

interior partition corners.

3. Provide integral colored masonry units for smooth and split faced units exposed to view. Color to be selected by Architects from Manufacturer's complete catalog.
4. Textures:
   a. Smooth-faced
   b. Split-faced

B. Concrete Masonry Units: ASTM C 90-94a and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength indicated: 2000 psi (13.8 MPa).
2. Weight Classification: Normal weight.
3. Aggregates: Do not use aggregates made from pumice, scoria, or tuff.
4. Size: Manufactured to the actual dimensions listed below (within tolerances specified in the applicable referenced ASTM specification) for the corresponding nominal sizes indicated on Drawings:
   a. 4 inch (100 mm) nominal: 3-5/8 inch (92 mm) actual.
   b. 6 inch (150 mm) nominal: 5-5/8 inch (144 mm) actual.
   c. 8 inch (200 mm) nominal: 7-5/8 inch (194 mm) actual.
   d. 16 inch (400 mm) nominal: 15-5/8 inch (397 mm) actual.
5. Exposed Faces: Manufacturer's color and texture selected by the Architect, unless otherwise indicated.

C. Split-faced Concrete Masonry Units: ASTM C 90 and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength indicated: 1900 psi (13.1 MPa).
2. Weight Classification: Normal weight.
3. Size: Manufactured to dimensions indicated for non-decorative units.
4. Finish: Exposed faces of the following general description matching color, pattern, and texture of Architect's sample.
   a. Normal-weight aggregate, split-face finish 8"H x 16"L.
   b. Normal-weight aggregate, so units laid in stone bond appear as units laid in stacked bond, split-faced finish and smooth as indicated on drawings.
5. Integral Water Repellent: Provide units produced w/liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made w/integral water repellent, when tested as a wall assembly made w/mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, w/test period extended to 24 hours, show no visible water or leaks on the back of the test specimen.
   a. Product: Subject to compliance with requirements, provide units made with: water repellant admixture.
      1) No fatty acid products, only liquid polymer water repellent material.
      2) Manufacturer of masonry units shall certify that units meet water repellent manufacturer's prequalification test for performance w/written confirmation from the products manufacture.
      3) Manufacturers:
         a) W.R. Grace: "Dry-Block"
         b) Addiment Inc.: Mortar tite
         c) Master Builder's: Master color from USA based location.

2.3 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 cement to produce mortar color indicated.

B. Masonry Cement: ASTM C 91.
1. For pigmented mortars, use premixed, colored masonry cements of formulation required to produce color indicated. Pigments shall not exceed 5 percent of masonry cement by weight for mineral oxides nor 1 percent for carbon black.

C. Aggregate for Mortar: ASTM C 144; use aggregate graded with 100 percent passing the No. 16 (1.18 mm) sieve: **Triple washed masonry sand** - Mortar Aggregates: Natural sand from a single

sole source supplier for the entire project.
1. Color: White sand to match existing mortar.

D. Aggregate for Grout: ASTM C 404.

E. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this Article; combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142. Colors shall be based on Lehigh Cement standard colors.

F. Water: Potable.

G. Products:
1. Water-Repellent Admixture:
a. Dry-Block Mortar Admixture; Grace: W.R. Grace & Co., Blocktite Mortar or Non-fatty acid product, only liquid polymer water repellent material with certified performance testing.

2.4 REINFORCING STEEL

A. Steel Reinforcing Bars: Material and grade as follows:
1. Billet steel complying with ASTM A 615 (ASTM A 615M): Grade 60 (Grade 400).

B. Deformed Reinforcing Wire: ASTM A 496, with ASTM A 153, Class B-2 zinc coating.

C. Welded-Wire Fabric: ASTM A 1064

2. 5 JOINT REINFORCEMENT

A. General: Provide joint reinforcement formed from the following:
1. Galvanized carbon-steel wire, coating class as follows:
a. ASTM A 641 (ASTM A 641M), Class 1, for interior walls; and ASTM A 153, Class B-2, for exterior walls.
b. ASTM A 153, Class B-2, for both interior and exterior walls.

B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet (3 m), with prefabricated corner and tee units, and complying with requirements indicated: Wire Diameter for Side Rods and Cross Rods: 0.1875 inch (4.8 mm).

C. For single-wythe masonry, provide type as follows with single pair of side rods: Truss design with continuous diagonal cross rods spaced not more than 16 inches (407 mm) o.c. Provide integral drip for double-wythe installations.

2.6 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of this Article, unless otherwise indicated.

B. Wire: As follows:
1. Galvanized Carbon-Steel Wire: ASTM A 1064; with ASTM A 153, Class B-2 coating for wire ties and anchors in exterior walls.

C. Masonry tie to steel stud walls:
1. Hohmann & Barnard - 16” o.c. horizontal, within 8” of corners & jamb of openings.

2.7 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, 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, Class C; of diameter and length indicated and in the following configurations:
1. Nonheaded bolts, bent in manner indicated.

B. Post-installed Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
   1. Type: Chemical anchors.
   2. Type: Expansion anchors.
   3. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Alloy Group 1 or 4) for bolts and nuts; ASTM A 167 or ASTM A 276, Type 304 or 316, for anchors.
   4. For Post-installed Anchors in Grouted Concrete Masonry Units: Capability to sustain, without failure, a load equal to 6 times the loads imposed by masonry.

2.8 EMBEDDED FLASHING MATERIALS

A. Laminated Flashing: Manufacturer's standard laminated flashing of type indicated below:
   1. Copper-Fabric Laminate: Copper sheet of weight indicated below, bonded with asphalt between 2 layers of glass-fiber cloth.
      a. Weight: 5 ounce per square foot (1.5 kg/sq. m).
   2. Application: Use where flashing is fully concealed in masonry.

B. Adhesive for Flashings: Of type recommended by manufacturer of flashing material for use indicated.

C. Products: Subject to compliance with requirements, provide one of the following:
   1. Rubberized Asphalt Sheet Flashing:
      a. Perm-A-Barrier Wall Flashing; Grace: W.R. Grace & Co.
      b. Polyguard 300; Polyguard Products, Inc.
   2. Carrier sheet:
      a. Stainless steel, .020”

2.9 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from the following material:
   1. Neoprene.
   2. Urethane.

B. Weep Holes: Provide the following:
   1. Rectangular Plastic Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches.
   2. Available Products: Subject to compliance with requirements, weep hole/ventilators that may be incorporated in the Work include the following:
      a. Weep Hole/Vent:
         1) Mortar Net Solutions (Cell Vent).
         2) Williams-Goodco Brick Vent; Williams Products, Inc. (vinyl).
         3) Advanced Building products (mortar maze).
         4) Mortar Net Solutions (mortar net).

2.10 MASONRY CLEANERS

A. Non-Acid Sensitive Masonry Cleaner shall be liquid blend of inhibited acidic ingredients and wetting agents formulated as a “carbon solubilizer” for brick. Maximum 5% muriatic acid shall be used. It shall be designed for use with high pressure water rinse, and shall remove atmospheric dirt, carbon, algae, and mold formation from masonry surfaces without harmful abrasives, and shall not “etch” or otherwise harm surface.

B. All Acid Sensitive Masonry Cleaner shall be cleaned using a low and medium pressure water washing system, which may be supplemented with a non-ionic detergent if found to be necessary.

C. Manufacturers:
   1. Acceptable products include the following:
      a. Chemprobe/Tex-cote/TNEMEC

1) Masonry Cleaners

b. Prosoco
1) Masonry Cleaners

c. Diedrich Technologies
1) Masonry Cleaners

2.11 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, air-entraining agents, accelerators, retarders, antifreeze compounds, or other admixtures, unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated below:
1. Limit cementitious materials in mortar to portland cement and lime.
2. For masonry below grade, in contact with earth, use type indicated: Type: S.
3. For reinforced masonry use type indicated: Type: S.
4. For exterior, above-grade, load-bearing and non-load bearing walls and parapet walls; for interior load-bearing walls; for interior non-load bearing partitions, and for other applications where another type is not indicated, use type indicated: Type: S.

C. Grout for Unit Masonry: Comply with ASTM C 476. Use grout of consistency indicated or, if not otherwise indicated, of consistency (fine or coarse) at time of placement that will completely fill spaces intended to receive grout.
1. Use fine grout in grout spaces less than 2 inches (50 mm) in horizontal dimension, unless otherwise indicated.
2. Use coarse grout in grout spaces 2 inches (50 mm) or more in least horizontal dimension, unless otherwise indicated.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

C. Examine select demolition & patching areas at new or deleted openings.

3.2 INSTALLATION, GENERAL

A. Thickness: Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.

B. Leave openings for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.

C. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arises, do not exceed

1/4 inch in 10 feet, nor 3/8 inch in 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet, nor 1/2 inch maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For top surface of bearing walls, do not exceed 1/8 inch in 10 feet, nor 1/16 inch within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet, nor 3/4 inch in 40 feet or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch (6 mm) nor plus 1/4 inch (12 mm).

E. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch. Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch. Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch. Do not vary from collar-joint thickness indicated by more than minus 1/4 inch or plus 3/8 inch.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
1. Running bond with vertical joint in each course centered on units in courses above and below (Wainscot and columns).
2. Stone pattern; Double stack running bond above Wainscot.

D. Lay concealed masonry with all units in a wythe in running bond. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

G. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
1. At exterior frames, insert extruded polystyrene board insulation around perimeter of frame in thickness indicated, but not less than 3/4 inch (19 mm) to act as a thermal break between frame and masonry.

H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

I. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows: (See drawings for pattern, stacked stone.)
   1. With full mortar coverage on horizontal and vertical face shells.
   2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
   3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
   4. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch (10-mm) joints.

B. Tool exposed joints:
   1. “V” jointed for CMU when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
   2. Concave tooled joints for brick colored mortar (match existing).

3.6 HORIZONTAL-JOINT REINFORCEMENT

A. General: Provide continuous horizontal-joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcing a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Provide reinforcement in mortar joint 1 block course above and below wall openings and extending 12 inches beyond opening.

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

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, pipe enclosures, and other special conditions.

3.7 LINTELS

A. Provide masonry or cast stone lintels where shown and where openings are of more than 24 inches (610 mm) for block units shown without structural steel or other supporting lintels.
   1. Provide built-in-place masonry lintels. Use specially formed bond beam units with reinforcement bars placed as indicated and filled with coarse grout. Temporarily support built-in-place lintels until cured.
   2. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.8 FLASHING AND WEEP HOLES

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer before covering with mortar.

C. Install flashing as follows:
   1. At composite masonry walls, extend flashing from exterior face of outer wythe of masonry, through the outer wythe.
   2. Form complete “pan” at window head and sills.

3.9 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.

E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Material completion.

3.10 MASONRY WASTE DISPOSAL

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

B. Disposal: Dispose of masonry waste, including broken masonry units, waste mortar, and excess or soil-contaminated sand, by removal from site. Remove masonry waste and legally dispose of off Owner's property.

END OF SECTION

DIVISION 4 – MASONRY
SECTION 04 73 00 – COLUMBARIUM NICHE COVERS

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the Contract and General Conditions and all Sections within Division 1 – General Requirements, which are hereby made part of this Section of the Specifications.

1.2 DESCRIPTION

A. Work Included: Provide labor and materials necessary to complete the work of this Section, including but not limited to the following:
   1. The Department of Veterans Affairs (VA) shall furnish niche covers for all of the new Columbarium Niches being installed by the Contractor. This specification section is for all work necessary for the Contractor to accept, handle, store, move and install one, government approved and provided, blank columbarium niche cover for each of the new precast niches created in the new columbarium walls. The government shall also provide, as part of the niche cover products manufactured for this project, a predetermined minimum number of approved blank niche covers to act as spares. The spare niche covers are to be used to replace niche covers should any damage occur, or for re-inscription necessitated by additional interment at a specific niche location.
   2. The number of approved government provided spare columbarium niche covers for this project to be accepted, offloaded and stored at the designated location is 960.

1.3 INSTALLER QUALIFICATIONS

A. Installation of columbarium niche covers will be performed by those companies who, through an approved certification process, have demonstrated previous experience in installation of similar design as indicated in the drawings and specified herein.

1.4 RELATED WORK

A. The following items are not included in this Section and will be performed under the designated Sections:
   1. Section 03 48 24: Precast Concrete Columbarium Units, the precast concrete niche units with: niche cover mounting hardware assemblies (installed); and niche cover attachment hardware assemblies (provided for use to attach the Government provided niche covers). Four each of the niche cover mounting hardware assemblies shall be furnished and installed for each precast concrete niche opening. Four each of the niche cover attachment hardware assemblies shall be provided for each precast niche opening, to be used to mount the approved government niche covers as indicated and on the drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 NICHE COVERS (GOVERNMENT PROVIDED) – CONTRACTOR ACCEPTANCE

A. Niche covers that have been inspected and accepted as being in compliance with manufacturing tolerances for size, hole size and placement, perpendicularity, finish, and product stone quality shall be furnished by the Government and delivered to the site on pallets. They shall be of size, type, manufacturing, finish and quantities required for this project. The covers shall be delivered to the site Freight on Board (FOB) and the Contractor shall be responsible to offload and secure them at the job site. The general quantity and condition shall be observed and an adequate count to cover all the installed columbarium units, plus required spares shall be verified by the Contractor prior to accepting the units and performing the offloading operations. Note any shipping damage and reject any damaged covers before the delivery truck leaves the site. Once satisfied, take ownership of the acceptable covers, as all being approved as meeting the

government specifications and being suitable for installation at this project. Once the niche covers are accepted at the site, they shall become the Contractors responsibility until installed and the installation is accepted by the Architect/Engineer.

3.2 INSPECTION

A. All materials shall be inspected prior to installation to ensure compliance with the contract documents and to insure there is no damage. Should conditions be different from those indicated on the contract documents, contractor should immediately notify the Architect/Engineer.

3.3 NICHE COVER ATTACHMENT HARDWARE

A. Each of the four niche cover attachment hardware assemblies provided, for each new precast concrete niche opening, as part of Section 03 48 24, Precast Concrete Columbarium Units, consists of: the stainless steel/rosette, stainless steel tamperproof screw and the white or clear washer beneath the rosette, that is to bear against the niche cover when rosette is snugged up causing the cover to stay in place against the face of the niche opening due to friction. All of the niche cover hardware (mounting and attachment assemblies) shall be as submitted and approved as part of the work in Section 03 48 24, Precast Concrete Columbarium Units.

B. The Contractor performing the installation of the niche covers shall maintain control of the niche cover attachment hardware assemblies from delivery to the site through acceptance of the installation of the government provided niche covers.

3.4 INSTALLATION

A. Installation of the government provided niche covers shall include all materials, manpower, tools and equipment required to receive the approved government provided niche covers from the manufacturer, and handle them as necessary and perform whatever work is needed to result in the successful installation of one niche cover for every precast concrete niche space created for this project.

B. The niche covers shall be installed so as to create a visual straight line along the top of the row of covers agreed to by the Architect/Engineer as the primary visual vertical reference line in the installation. The covers shall be spaced achieve, as close as possible, the intended design spacing, taking into consideration the allowable fluctuations in the manufacturing tolerances for the government provided niche covers.

C. The niche cover attachment assemblies shall be installed so that the threaded end of the tamperproof screw is inserted into the threads of the spring clip on the mounted angle bracket behind each of the mounting holes in the niche covers. This should result in the head of the screw being parallel with the face of the niche cover. The threaded hole in the spring clip shall be fully visible when looking through the mounting hole in the niche cover to the respective spring clip behind the hole. The position of the spring clip shall be adjusted so the threaded tamperproof screw will enter the threaded hole in the spring clip and that the attachment assembly can be tightened to secure the cover in the intended position. To achieve this installation, the angle brackets shall be adjusted to be the correct height from the niche wall so the hole in the spring clip can have the respective tamper proof screw inserted and tightened. To achieve the proper positioning of the spring clips, the angle brackets shall be adjusted in their position, or the hole in the angle bracket through which the tamper proof screw passes when tightened into the spring clip, shall be enlarged as necessary to allow the adjustment of the spring clip to align with the hole in the niche cover so the tamper proof screws through the individual rosettes can each be inserted and tightened using the threaded spring clip. Only correct installations of the tamperproof screws, inserted into the threads of the spring clip and being tightened are acceptable. The head of the tamperproof screw shall be snugged up tight against the rosette, and shall be seated against the rosette, which occurs when the tamperproof screw is approximately perpendicular to the face of the niche cover.

3.5 CLEANING AND PROTECTION

A. Columbarium niche covers shall be shop cleaned at the time of fabrication. After installation, carefully clean the markers, removing all dirt stains, and all other incident defacements.
   1. Stiff bristle fiber brushes may be used, but the use of wire brushes or acid-type cleaning agents and other solutions which may cause discoloration is expressly prohibited. Fabricator should be contacted regarding the use of any cleaners and must approve of them before use.
   2. Protection of Finished Work: All covers that are installed as part of the work in progress shall be protected at all times during construction by use of a suitable strong, impervious film or fabric securely held in place.

B. Clean up area of excess material and debris. Clean visible portions of all covers.

END OF SECTION

DIVISION 4 – MASONRY
SECTION 04 73 10 – MEMORIAL WALL MARKERS

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the Contract and General Conditions and all Sections within Division 1 – General Requirements, which are hereby made part of this Section of the Specifications.

1.2 DESCRIPTION

A. Work Included: Provide labor and materials necessary to complete the work of this Section, including but not limited to the following:
   1. The Department of Veterans Affairs (VA) shall furnish memorial wall markers for new Memorial Wall being installed by the Contractor. This specification section is for all work necessary for the Contractor to accept, handle, store, move and install one, government approved and provided, blank memorial wall markers for each of the new memorial wall unit. The government shall also provide, as part of the memorial wall markers products manufactured for this project, a predetermined minimum number of approved blank memorial wall markers to act as spares. The spare memorial wall markers are to be used to replace memorial wall markers should any damage occur, or for re-inscription necessitated by additional interment at a specific marker location.
   2. The number of approved government provided spare columbarium memorial wall markers for this project to be accepted, offloaded and stored at the designated location is 140.

1.3 INSTALLER QUALIFICATIONS

A. Installation of columbarium memorial wall markers will be performed by those companies who, through an approved certification process, have demonstrated previous experience in installation of similar design as indicated in the drawings and specified herein.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 MEMORIAL WALL MARKERSS (GOVERNMENT PROVIDED) – CONTRACTOR ACCEPTANCE

A. Memorial wall markers that have been inspected and accepted as being in compliance with manufacturing tolerances for size, hole size and placement, perpendicularity, finish, and product stone quality shall be furnished by the Government and delivered to the site on pallets. They shall be of size, type, manufacturing, finish and quantities required for this project. The covers shall be delivered to the site Freight on Board (FOB) and the Contractor shall be responsible to offload and secure them at the job site. The general quantity and condition shall be observed and an adequate count to cover all the installed memorial wall units, plus required spares shall be verified by the Contractor prior to accepting the units and performing the offloading operations. Note any shipping damage and reject any damaged covers before the delivery truck leaves the site. Once satisfied, take ownership of the acceptable covers, as all being approved as meeting the government specifications and being suitable for installation at this project. Once the memorial wall markers are accepted at the site, they shall become the Contractors responsibility until installed and the installation is accepted by the Architect/Engineer.

3.2 INSPECTION

A. All materials shall be inspected prior to installation to ensure compliance with the contract documents and to insure there is no damage. Should conditions be different from those indicated on the contract documents, contractor should immediately notify the Architect/Engineer.

3.3 MEMORIAL WALL MARKERS ATTACHMENT HARDWARE

A. Each of the memorial wall markers attachment hardware assemblies provided consists of: the stainless steel/rosette, stainless steel tamperproof screw and the white or clear washer beneath the rosette, that is to bear against the memorial wall markers when rosette is snugged up causing the cover to stay in place against the face of the wall due to friction. All of the memorial wall markers hardware (mounting and attachment assemblies) shall be as submitted and approved as part of the work in this section. See Memorial Wall Drawing for details.

B. The Contractor performing the installation of the memorial wall markers shall maintain control of the memorial wall markers attachment hardware assemblies from delivery to the site through acceptance of the installation of the government provided memorial wall markers.

3.4 INSTALLATION

A. Installation of the government provided memorial wall markers shall include all materials, manpower, tools and equipment required to receive the approved government provided memorial wall markers from the manufacturer, and handle them as necessary and perform whatever work is needed to result in the successful installation of memorial wall markers for this project.

B. The memorial wall markers shall be installed so as to create a visual straight line along the top of the row of covers agreed to by the Architect/Engineer as the primary visual vertical reference line in the installation. The markers shall be spaced achieve, as close as possible, the intended design spacing, taking into consideration the allowable fluctuations in the manufacturing tolerances for the government provided memorial wall markers.

C. The memorial wall markers attachment assemblies shall be installed so that the threaded end of the tamperproof screw is inserted into the threads of the spring clip on the mounted angle bracket between each of the memorial wall markers. This should result in the head of the screw being parallel with the face of the memorial wall markers. The threaded hole in the spring clip shall be fully visible when looking between the memorial wall markers to the respective spring clip behind the hole. The position of the spring clip shall be adjusted so the threaded tamperproof screw will enter the threaded hole in the spring clip and that the attachment assembly can be tightened to secure the cover in the intended position. To achieve this installation, the angle brackets shall be adjusted to be the correct height from the wall so the hole in the spring clip can have the respective tamper proof screw inserted and tightened. To achieve the proper positioning of the spring clips, the angle brackets shall be adjusted in their position, or the hole in the angle bracket through which the tamper proof screw passes when tightened into the spring clip, shall be enlarged as necessary to allow the adjustment of the spring clip to align between the memorial wall markers so the tamper proof screws through the individual rosettes can each be inserted and tightened using the threaded spring clip. Only correct installations of the tamperproof screws, inserted into the threads of the spring clip and being tightened are acceptable. The head of the tamperproof screw shall be snugged up tight against the rosette, and shall be seated against the rosette, which occurs when the tamperproof screw is approximately perpendicular to the face of the memorial wall markers. See Connection Details on Memorial Wall Drawing.

3.5 CLEANING AND PROTECTION

A. Memorial wall markers shall be shop cleaned at the time of fabrication. After installation, carefully clean the markers, removing all dirt stains, and all other incident defacements.
   1. Stiff bristle fiber brushes may be used, but the use of wire brushes or acid-type cleaning agents and other solutions which may cause discoloration is expressly prohibited. Fabricator should be contacted regarding the use of any cleaners and must approve of them before use.
   2. Protection of Finished Work: All covers that are installed as part of the work in progress shall be protected at all times during construction by use of a suitable strong, impervious film or fabric securely held in place.

B. Clean up area of excess material and debris. Clean visible portions of all covers.

END OF SECTION

DIVISION 4 - MASONRY
SECTION 04 86 00 - STONE MASONRY - GRANITE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Granite “Section Markers” for Burial Sections.

B. Granite Columbarium End Panels & Cap Stone.

C. Granite block for Committal Shelter Column Caps.

1.2 REFERENCES

A. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.

B. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar.

C. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.

D. ASTM C 150 - Standard Specification for Portland Cement.

E. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.

F. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.

G. ASTM C 615 - Standard Specification for Granite Dimension Stone.

H. NBGQA - Specifications for Architectural Granite; National Building Granite Quarries Association.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00 “Submittals”.

B. Product Data: Manufacturers' product literature for the following:
1. Stone units.
2. Mortars.
3. Setting materials.
4. Grouts.
5. Sealants.

C. Shop Drawings:
1. Indicate layout, dimensions, bedding, bonding, jointing, and anchoring details.
2. Include dimensions and setting number of each piece of granite.

D. Samples:
1. Granite: For each specified color/grain and finish, submit three samples 12 inches (304 mm) square in size, illustrating texture, finish, and anticipated range of color to be supplied.
2. All other materials:
   a. For each material requiring color selection, two sets of samples representing manufacturer's full range of available colors.
   b. For each material having color specified, two 12-inch (304 mm) samples indicating match to specified color.

E. Quality Assurance Submittals:
1. Manufacturers' instructions: Printed installation instructions for each product, including product storage requirements.

F. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.4 QUALITY ASSURANCE

A. Pre-Installation Meetings:
1. Convene at job site one (1) calendar day prior to scheduled beginning of construction activities of this section to review requirements of this section.
2. Require attendance by representatives of the following:
a. Installer of this section.
b. Other entities directly affecting, or affected by, construction activities of this section.
3. Notify Architect seven (7) calendar days in advance of scheduled meeting date.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Pack and load finished granite, using precautions against damage in transit; do not use materials for packing or blocking that may stain or discolor granite.

B. Storage and Handling:
1. Stack granite on timber or wooden platforms at project site, elevating granite at least 3 inches (76 mm) above gravel storage area.
2. Use polyethylene or other non-staining plastic film to prevent granite contact with wood or other supporting material and to cover stacked granite with tarps.
3. Plug Lewis holes during freezing weather to prevent accumulation of water.

1.6 PROJECT CONDITIONS

A. Maintain materials and ambient air to a minimum of 40 degrees F (4 degrees C) prior to, during, and 48 hours after completion of granite installation.

B. During temporary storage on site, at the end of working day, or during rainy weather, cover granite exposed to weather with non-staining waterproof coverings, securely anchored.

PART 2 – PRODUCTS

2.1 GRANITE

A. Granite for Columbarium End Panels & Cap Stone:
1. Characteristics: Conforming to ASTM C 615, standard architectural grade, and NBGQA reference; free of cracks, seams, or starts which could impair structural integrity or function.
2. Color/grain: Georgia gray with black specks. Polished faces (match existing sample). Color: “Georgia Gray” from Elite Stone Solutions
3. Acceptable Manufacturers:
a. Elite Stone Solutions (Basis of Design).
b. Eagle Granite.
c. Coldwater Granite, LLC
4. Texture/Finish: Ground Non-Slip Surface.

B. Select granite units to achieve consistency in color and texture between adjacent units, within range of approved samples.

2.2 SETTING MATERIALS AND GROUTS

A. Commercial Portland Cement Grout:
   1. Characteristics: Portland cement, with sand and mineral filler coloring agents, factory-mixed; conforming to ANSI A118.6 H-2.1.
   2. Color: To be selected from manufacturer's full range of available colors.

2.3 ACCESSORIES

A. Anchoring Devices: Cramps, dowels, ties, and other anchoring devices of stainless steel conforming to ASTM A 666, Type 304, of sizes and configurations indicated on approved shop drawings.

B. Setting Buttons and Shims: Lead or plastic type.

C. Miscellaneous Accessories: Supply additional components specified in ANSI specifications for indicated installation.

D. Sealant: Polyurethane type specified in Section 07 92 00 “Joint Sealants & Gasketing” color to match granite gray color.

E. Sealant Backer: Grout & foam backer rod as specified in Section 07 92 00 “Joint Sealants & Gasketing”.

2.4 MIXES

A. Setting Mortar: Mix one part Portland cement to one part hydrated lime and three parts of sand.

B. Pointing Mortar:
   1. Mix one part Portland cement to one and one-half parts hydrated lime and three parts of sand.
   2. Add mortar color in accordance with manufacturer's instructions; ensure uniformity of mix and coloration.

C. Do not use anti-freeze compounds to lower the freezing point of mortars.

D. Mix mortar in small batches, using only enough water to achieve homogeneous mixture that is stiff and plastic.

E. Let mortar set for one hour before using, and use within two hours of mixing.

2.5 FABRICATION

A. Acceptable Manufacturer/Fabricator:
   1. Polycor/Georgia Marble.
   2. Fletcher Granite Co., Inc.
   3. Rock of Ages Corp.
   4. Eagle Granite Co.

B. Substitutions will be considered if Contractor can demonstrate that their suggested design/ material is equivalent to those specified in the Construction Documents.

C. Granite Columbarium Stone Caps:
   1. Panel face dimensions: Indicated on drawings.
   2. Face finish: Polished
   3. Slope exposed top surfaces of cap stones, sill surfaces, and other exposed horizontal surfaces for natural wash.

4. Install drip edge profile on stone caps.

D. Dimensional Tolerances: In accordance with NBGQA reference, and as follows:
1. Panel thickness: Variation from nominal dimension not to exceed the following:
a. Over 1-5/8 inches (41.2 mm): Plus or minus 1/4 inch (6.3 mm)
2. Panel face dimensions: Plus or minus 1/16 inch (1.5 mm)
3. Face variation from square: Plus or minus 1/16 inch (1.5 mm), non-cumulative.
4. Flatness: Variation from true plane, as determined over a 4-foot (1.2 m) dimension in any direction on the surface:
a. Polished, honed, or fine rubbed finishes: 1/16 inch (1.5 mm), or one-third specified joint width, whichever is greater.
5. Beds and joints: In accordance with approved shop drawings, with bed and joint surfaces cut as follows:
a. Polished, honed, or fine rubbed finished granite, 4 inches (101 mm) or less in thickness: 3/8 inch (9.5 mm) beds and joints; sawn or cut full square back from the face at least two-thirds of total thickness; beyond that dimension, beds may fall under square not more than 1 inch (25 mm).
b. Polished, honed, or fine rubbed finished granite over 4" thick: 3/8" beds/joints; sawn or cut full square 2" back from face; beyond that dimension, beds may fall under square not more than 1" in 12" & be reasonably free of large depressions; joints may fall under square not more than 1-1/2" in 12 inches (304 mm).

2.6 SOURCE QUALITY CONTROL

A. Obtain all granite required for project from one fabricator having access to quarries having adequate capacity and facilities to meet specified requirements.

B. Do not finish to final size any granite product until shop drawings for product have been approved.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that support structure, foundations, and project conditions are correct and ready to receive granite units.

3.2 GRANITE MARKER INSTALLATION

A. Establish lines and levels of granite markers.

B. Clean granite prior to installation, using methods that will not mark or damage sight-exposed surfaces.

C. Set granite in full mortar setting bed to support stone fully over bearing surface. Epoxy grout concealed anchor pins (stainless steel).

D. Joints:
1. Rake out mortar joints 5/8 inch (15 mm) to 3/4 inch (19 mm) to accommodate joint sealant; brush joints clean.
2. Fill joints with pointing mortar; pack and work into voids
3. Tool sealant joint surface to concave profile.

3.3 CLEANING

A. Remove excess mortar, setting materials, grout, and sealant as construction activities of this section progress; do not allow mortar, setting materials, grout, or sealant to remain to set on granite surfaces.

B. Clean soiled surfaces with cleaning solution recommended by granite fabricator, use non-metallic tools.

C. Apply D2 Biological Solution to new granite for protection against microbial build-up.

3.4 PROTECTION

A. During installation of granite, protect from damage by covering with non-staining impervious film or fabric, held securely in place.

B. After installation of granite, protect from damage by other construction activities until Final Completion by covering with non-staining impervious film or fabric, held securely in place.

END OF SECTION

DIVISION 5 - METALS
SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS AND WORK

A. The Division 1 General Requirements, Specifications, Drawings, Addenda, and Modifications are binding on all work for this Project.

1.2 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following codes, standards and specifications, except as otherwise shown and specified:

1. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
   - ANSI A10.3 (Safety Requirements for Powder-Actuated Fastening Systems
2. AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
   - ASME B18.2.6 Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)
   - ASME B18.6.2 Slotted Head Cap Screws, Square Head Set Screws and Slotted Headless Set Screws
   - ASME B18.6.3 Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series)
   - ASME B18.21.1 Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)
3. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
   - ASTM A36 Carbon Structural Steel
   - ASTM A47 Ferritic Malleable Iron Castings
   - ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   - ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   - ASTM A167 Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip (Withdrawn 2014)
   - ASTM A500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
   - ASTM A780 Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
   - A307-14 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
   - C1107-13 Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
   - F468-06(R2015) Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws and Studs for General Use
   - F1667-15 Driven Fasteners: Nails, Spikes and Staples
4. AMERICAN WELDING SOCIETY (AWS)
   - D1.1-15 Structural Welding Code Steel

1.3 SUBMITTALS

A. Submit manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions for products to be used in miscellaneous metal work.

B. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.4 COOPERATION

A. Work of this section shall be fitted to work of all other applicable sections and coordinated to best advantage of entire job. Do all required cutting, drilling, fitting and tapping for securing work in position to accommodate work of other sections. Items fabricated for support of items installed by other sections shall be shop painted as specified herein.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel shall be as per ASTM A36, ASTM A440, ASTM A283, ASTM A306 (as applicable).

B. Cast steel shall be as per ASTM A27, ASTM A148, (as applicable).

C. Steel forgings shall be as per ASTM A235, ASTM A237, (as applicable).

D. Bolts and fasteners shall be as per ASTM A307, ASTM A325, ASTM A354, (as applicable).

E. Cold Rolled Carbon Steel Sheets: ASTM A366.

F. Paint for metal primer shop coats shall be approved type primer (See Section 09 91 00 “Painting”)
1. Primer paint selected must be fully compatible with the required finish coats of paint specified. Coordinate selection of metal primer with finish paint requirements.
2. Galvanizing Repair and Primer Paint: Zinc dust, zinc oxide, alkyd paint conforming to FS TT-P-641G, Type II.

G. Steel Pipe (Bollard): ASTM A53.
1. Galvanized for exterior locations.
2. Type S, Grade A unless specified otherwise.
3. NPS (inside diameter) as shown.

H. All products must be fully BABAA Compliant. Submit Certificate of BABAA Compliance with Manufacturer’s Product Certification Letter on Manufacturer's letterhead.

2.2 FABRICATION GENERAL

A. Material:
1. Use material as specified. Use material of commercial quality and suitable for intended purpose for material that is not named or its standard of quality not specified.
2. Use material free of defects which could affect the appearance or service ability of the finished product.

B. Size:
1. Size and thickness of members as shown.
2. When size and thickness is not specified or shown for an individual part, use size and thickness not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.

C. Connections:
1. Except as otherwise specified, connections may be made by welding, riveting or bolting.
2. Field riveting will not be approved.
3. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.
4. Holes, for rivets and bolts: Accurately punched or drilled and burrs removed.
5. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
6. Use Rivets and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.
7. Use stainless steel connectors for removable members machine screws or bolts.

D. Fasteners and Anchors:
1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.

2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self drilling and tapping screws or bolts.

E. Workmanship
1. General:
   a. Fabricate items to design shown.
   b. Furnish members in longest lengths commercially available within the limits shown and specified.
   c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
   d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
   e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
   f. Prepare members for the installation and fitting of hardware.
   g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.
   h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.
2. Welding:
   a. Weld in accordance with AWS.
   b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.
   c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.
   d. Finish welded joints to match finish of adjacent surface.
3. Joining:
   a. Miter or butt members at corners.
   b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.
4. Anchors:
   a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.
   b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.
5. Cutting and Fitting:
   a. Accurately cut, machine and fit joints, corners, copes, and miters.
   b. Fit removable members to be easily removed.
   c. Design and construct field connections in the most practical place for appearance and ease of installation.
   d. Fit pieces together as required.
   e. Fabricate connections for ease of assembly and disassembly without use of special tools.
   f. Joints firm when assembled.
   g. Conceal joining, fitting and welding on exposed work as far as practical.
   h. Do not show rivets and screws prominently on the exposed face.

i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.

F. Finish:
1. Steel and Iron: NAAMM AMP 504.
a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
b. Surfaces exposed in the finished work:
1) Finish smooth rough surfaces and remove projections.
2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
c. Shop Prime Painting:
1) Surfaces of Ferrous metal:
a) Items not specified to have other coatings.
b) Galvanized surfaces specified to have prime paint.
c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00 “Painting”.

2.3 FASTENERS

A. Select fasteners for the type, grade and class required for the installation of miscellaneous metal items.

B. Standard Bolts and Nuts: ASTM A307, Grade A, regular hexagon head.

C. Lag Bolts: FS FF-B-561C, square head type.

D. Machine Screws: FS FF-S-92B, cadmium plated steel.

E. Wood Screws: FS FF-S111D, flat head carbon steel.

F. Plain Washers: FS FF-W-92B, round, general assembly grade carbon steel.

G. Lock Washers: FS FF-W84G, helical spring type carbon steel.

H. Masonry Anchorage Devices: Expansion shields, FS FF-S-325-57.

2.4 STEEL PIPE BOLLARD

A. Provide bollard in accordance with ASTM A53 with as indicated on project drawings.

B. Anchor posts in concrete and fill solidly with concrete with a minimum compressive strength of 17 MPa 2500psi.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.

B. Items set into concrete or masonry.
1. Provide temporary bracing for such items until concrete or masonry is set.
2. Place in accordance with setting drawings and instructions.
3. Build strap anchors, into masonry as work progresses.

C. Field weld in accordance with AWS.
   1. Design and finish as specified for shop welding.
   2. Use continuous weld unless specified otherwise.

D. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified. Power actuated drive pins may be used except for removable items and where members would be deformed or substrate damaged by their use.

3.2 SHOP PAINTING

A. Ferrous metals shall be cleaned of rust, scale, dirt and shall be given shop coats of approved zinc chromate primer or red oxide as specified under "Materials".

B. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 "Hand Tool Cleaning" or SSPC SP-3-63 "Power Tool Cleaning" or SSPC SP-7-63 "Brush-Off Blast Cleaning". Remove oil areas and similar contaminants in accordance with SSPC SP-1-63 "Solvent Cleaning".
   1. Immediately after the surface preparation, brush or spray on metal primer paint, applied in accordance with the manufacturer's instructions and at a rate to provide a uniform dry film thickness of 2.0 mils for each coat. Use painting methods which will result in full coverage of joints, corners, edges and all exposed surfaces.

C. Apply a bituminous coating of approximately 30 mil dry film thickness or other suitable permanent separator, on concealed contact surfaces of dissimilar materials before assembly or installation wherever there is the possibility of corrosive or electrolytic action.

3.3 FABRICATION

A. Use materials of the size and thicknesses indicated or if not indicated, of the required size and thickness to produce adequate strength and durability in finished product for the intended use.
   1. Provide for anchorage of the type shown, coordinated with the supporting structure and the progress schedule.
   2. Cut, reinforce, drill and tap miscellaneous metal work indicated to receive finish hardware and similar items of work.

3.4 WORKMANSHIP AND INSTALLATION

A. All miscellaneous metal items shall be accurately fabricated and erected with exposed joints close fitted. Joints shall be of such character, so assembled that they will be as strong and rigid as adjoining sections. Joints shall be located where least conspicuous.

B. Members to be built in with masonry or concrete shall be in form affording suitable anchorage or shall be provided with approved anchors or other approved means of securing members.

C. Threaded connections shall be made up tight so that threads will be entirely concealed. Projecting bolts shall be cut off flush with nuts where they are exposed or where they would interface with other work.

D. Fasteners shall be of compatible metal to metal item secured.

E. Do necessary cutting, drilling, fitting as required for installation of miscellaneous metal work. Work shall be carefully done, and when required, shall be fitted at building before finishing.

F. Ferrous and non-ferrous metals shall be insulated at contacts with felt washers, strips or sheets, bitumastic paints or other approved means.

G. Where aluminum is in contact with cement mortar, concrete or masonry, contacting surfaces shall be coated with an approved asphaltic paint.

H. Provide loose plates, hangers, brackets, sleeves, anchors and bolts as required to complete work provided under other sections. Employ only mechanics skilled in work specified herein.

I. Provide required fastening, hangers, anchor brackets, lugs sleeves, straps, bolts, similar items required to set, connect and secure work.

J. Except where otherwise indicated and specified for particular item of work or where work is required to be built in, fasten to masonry with approved type fastenings. Fastening to wood plugs set in masonry will not be permitted.

K. Defective work whether in materials, fabrication, installation or workmanship shall be rejected. Remove and replace such rejected work at no extra cost.

3.5 SHELF ANGLES

A. Anchor shelf angles with 19 mm (3/4 inch) bolts unless shown otherwise in adjustable malleable iron inserts, set level at elevation shown.

B. Provide expansion space at end of members.

3.6 INSTALLATION OF STEEL PIPE BOLLARD

A. Set bollards vertically in concrete piers. Compressive strength of concrete piers shall be 21MPa 3000psi. For dimensions of concrete piers see project drawings.

END OF SECTION

DIVISION 5 – METALS
SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel shapes, plates, and bars.
2. Structural pipe.
3. Bolts, nuts, and washers.

1.2 RELATED REQUIREMENTS

A. Materials Testing And Inspection During Construction: Section 01 45 29, TESTING LABORATORY SERVICES.

B. Steel Joist: Section 05 21 00, STEEL JOIST FRAMING.

C. Steel Decking: Section 05 31 00, STEEL DECKING.

D. Painting: Section 09 91 00, PAINTING.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American Institute of Steel Construction (AISC):

1. AISC Manual - Steel Construction Manual, 16th Ed.
2. 303-10 - Code of Structural Steel Buildings and Bridges.
3. 360-10: Specification for Structural Steel Buildings.

C. The American Society of Mechanical Engineers (ASME):

1. B18.22.1-09 - Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers.

D. American Welding Society (AWS):

1. D1.1/D1.1M-15 - Structural Welding Code - Steel.

E. ASTM International (ASTM):

1. A6/A6M-14 - General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
2. A36/A36M-14 - Carbon Structural Steel.
3. A53/A53M-12 - Pipe, Steel, Black and Hot-Dip, Zinc-Coated, Welded and Seamless.
4. A283/A283M-13 - Low and Intermediate Tensile Strength Carbon Steel Plates.
5. A307-14 - Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
6. A500/A500M-13 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing and Rounds and Shapes.
7. A992/A992M-15 - Structural Shapes.

8. F3125/F3125M-15 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions

F. Occupational Safety and Health Administration (OSHA):
1. 29 CFR 1926.752(e) - Guidelines For Establishing The Components Of A Site-Specific Erection Plan.
2. 29 CFR 1926-2001 - Safety Standards for Steel Erection.

G. Research Council on Structural Connections (RCSC) of The Engineering Foundation:
1. Specification for Structural Joints Using ASTM F3125 Bolts.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
1. Show size, configuration, and fabrication and installation details.

C. Sustainable Construction Submittals:
1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

D. Test Reports: Certify products comply with specifications.
1. Welders' qualifying tests.

E. Certificates: Certify each product complies with specifications.
1. Structural steel.
2. Steel connections.
3. Welding materials.
4. Shop coat primer paint.

F. Qualifications: Substantiate qualifications comply with specifications.
1. Fabricator.
2. Installer.
3. Welders and welding procedures.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: AISC Quality Certification participant designated as AISC Certified Plant, Category STD.
1. Regularly fabricates specified products.
2. Fabricated specified products with satisfactory service on five similar installations for minimum five years.

B. Installer Qualifications: AISC Quality Certification Program participant designated as AISC-Certified Erector, Category ACSE.
1. Regularly installs specified products.
2. Installed specified products with satisfactory service on five similar installations for minimum five years.

C. Before commencement of Work, ensure steel erector provides written notification required by OSHA 29 CFR 1926.752(e). Submit a copy of the notification to Contracting Officer's Representative.

D. Welders and Welding Procedures Qualifications: AWS D1.1/D1.1M.

1.6 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in state where project is located.

2.2 MATERIALS

A. W-Shapes:
   1. ASTM A992/A992M.
   2. ASTM A572/A572M; Grade 50.
   3. ASTM A529; Grade 50.

B. Channel and Angles:
   1. ASTM A36/A36M.
   2. ASTM A572/A572M; Grade 50.
   3. ASTM A529; Grade 50.

C. Plates and Bars:
   1. ASTM A36/A36M.
   2. ASTM A572/A572M; Grade 50.
   3. ASTM A529; Grade 50.

D. Hollow Structural Sections:
   1. ASTM A500/A500M.

E. Structural Pipe: ASTM A53/A53M, Grade B.

F. Bolts, Nuts and Washers:
   1. High-strength bolts, including nuts and washers: ASTM F3125.
   2. Bolts and nuts, other than high-strength: ASTM A307, Grade A.
   3. Plain washers, other than those in contact with high-strength bolt heads and nuts: ASME B18.22.1.

G. Welding Materials: AWS D1.1, type to suit application.

2.3 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Sustainable Construction Requirements:
   1. Steel Recycled Content: 30 percent total recycled content, minimum.

2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
   a. Paints and coatings.

2.4 FABRICATION

A. Fabricate structural steel according to Chapter M, AISC 360.

B. Shop and Field Connections:

1. Weld connections according to AWS D1.1/D1.1M. Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.1 to perform type of work required.
2. High-Strength Bolts: High-strength bolts tightened to a bolt tension minimum 70 percent of their minimum tensile strength. Tightening done with properly calibrated wrenches, by turn-of-nut method or by use of direct tension indicators (bolts or washers). Tighten bolts in connections identified as slip-critical using Direct Tension Indicators. Twist-off torque bolts are not an acceptable alternate fastener for slip critical connections.

2.5 FINISHES

A. Shop Priming:

1. Prime paint structural steel according to AISC 303, Section 6.

2.6 ACCESSORIES

A. General: Shop paint steel according to AISC 303, Section 6.

PART 3 - EXECUTION

3.1 ERECTION

A. Erect structural steel according to AISC 303 and AISC 360.

B. Set structural steel accurately at locations and elevations indicated on drawings.

C. Maintain erection tolerances of structural steel within AISC 303 requirements.

1. Pour Stop Elevation Tolerance: 6 mm (1/4 inch), maximum, before concrete placement.

D. Weld and bolt connections as specified for shop connections.

3.2 FIELD PAINTING

A. After welding, clean and prime weld areas to match adjacent finish.

B. Touch-up primer damaged by construction operations.

C. Finish Painting: As specified in Section 09 91 00, PAINTING.

END OF SECTION

DIVISION 5 – METALS
SECTION 05 21 00 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies open web.

1.2 RELATED WORK:

A. Structural Steel: Section 05 12 00, STRUCTURAL STEEL FRAMING.

B. Finish Painting: Section 09 91 00, PAINTING.

1.3 DESIGN REQUIREMENTS:

Design all elements with the latest published version of applicable Codes.

1.3 TOLERANCES:

Deviation from a straight line between ends of any installed joist shall not exceed 10 mm in 3 m (3/8 inch in 10 feet).

1.4 REGULATORY REQUIREMENTS:

STEEL JOIST INSTITUTE: Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders, (Latest Edition).

1.5 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop and Erection Drawings: Complete.

1. Fabrication drawings including details and schedules for the fabrication and assembly of each joist.
2. Erection drawings showing the size and location of each joist, bridging, cross bracing, bearing details, connections, welds, bolts and bearing plates.

C. Certificates: STEEL JOIST INSTITUTE compliance.

1.6 QUALITY ASSURANCE:

Provide documentation that the joist manufacturer is a member of the Steel Joist Institute and has satisfactorily completed work of a similar scope and nature.

1.7 APPLICABLE PUBLICATIONS:

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.

B. American Institute of Steel Construction (AISC):

1. Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design (Latest Edition).
2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Latest Edition).

C. American Society for Testing and Materials (ASTM):

A307-07.....Carbon Steel Bolts and Studs, 400 MPa (60,000 psi) Tensile Strength

F3125/F3125M-15 .....Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions

D. American Welding Society (AWS):

D1.1-08.....Structural Welding Code – Steel

E. Steel Joist Institute (STEEL JOIST INSTITUTE):

Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders (Latest Edition).

PART 2 - PRODUCTS

2.1 OPEN WEB STEEL JOISTS:

Special Joist Profile conforming to STEEL JOIST INSTITUTE standard specifications.

2.2 ACCESSORIES – FITTINGS:

A. Accessories and fittings, including end supports and bridging, in accordance with standard STEEL JOIST INSTITUTE specification under which joists were designed.

B. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular hexagon type, low carbon steel.

C. High-strength bolts, including nuts and washers: ASTM F3125 heavy hexagon structural bolts.

PART 3 - EXECUTION

3.1 FABRICATION:

A. Fabrication and assembly in accordance with applicable standard STEEL JOIST INSTITUTE specification:

1. Make chord splices with full penetration welds capable of developing the ultimate strength in tension of the parent material. Make no allowance for the strength of back-up bars or other material incidental to welding.
2. Provide shop-welded connection plates at panel points to receive supplemental framing.
3. Extended Ends: Provide extended ends on joists where shown, complying with manufacturer’s standards and requirements of applicable STEEL JOIST INSTITUTE specifications.
4. Bridging: Provide horizontal or diagonal type bridging for joists and joist girders, complying with STEEL JOIST INSTITUTE specifications. Provide bridging anchors for ends of bridging lines terminating at walls or beams. Provide bridging adequate to resist the loads indicated on the Contract Documents.
5. End Anchorage: Provide end anchorages, including bearing plates, to secure joists to adjacent construction, complying with STEEL JOIST INSTITUTE specifications, unless otherwise indicated. Design all end anchorages to resist a minimum net uplift of 1.6 kPa (20 pounds per square foot) of supported area.
6. Provide supplemental steel support framing for metal deck where normal deck bearing is precluded by other framing members and minor openings.

3.2 SHOP PAINTING:

A. Shop painting in accordance with applicable STEEL JOIST INSTITUTE standard specification.

B. Shop paint joists and accessories with a rust-inhibiting primer paint. For joists which will be finish painted, limit paint to a primer which is compatible with specified finish paint. In high humidity areas, shop paint joists with a zinc-rich primer to receive top coats per the paint system manufacturer’s recommendations.

3.3 ERECTION:

A. Installation of joists in accordance with applicable STEEL JOIST INSTITUTE standard specification.

B. Handle joists in a manner to avoid damaging of joists. Remove damaged joists from site, except when field repair is approved and such repairs are satisfactorily made in accordance with manufacturer's recommendations.

C. Accurately set joists and end anchorage in accordance with the applicable STEEL JOIST INSTITUTE standard specification. Secure joists resting on masonry or concrete bearing surfaces by welding or bolting to the steel bearing plates as indicated on the Contract Documents. Secure bridging and anchoring in place prior to application of any construction loads. Distribute any temporary loads so that carrying capacity of any joist is not exceeded. Loads shall not be applied to bridging where joist lengths are 12 m (40 feet) and longer. Where joist lengths are 12 m (40 feet) and longer, install a center row of bolted diagonal bridging to provide lateral stability before slackening of hoisting lines.

3.4 FIELD PAINTING:

A. Clean abraded, corroded, and field welded areas and touch up with same type of paint used in shop painting.

B. Finish painting of steel surfaces is specified in Section 09 91 00, PAINTING.

END OF SECTION

DIVISION 5 – METALS
SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single pan fluted metal roof deck as roof substrate.

1.2 RELATED WORK

A. Section 05 21 00, STRUCTURAL STEEL FRAMING: Structural Steel Shapes.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. AISI - American Iron and Steel Institute.

S100-16 .....Specification for the Design of Cold-formed Steel Structural Members.

C. American Welding Society (AWS):

D1.1/D1.1M-20 .....Structural Welding Code - Steel.

1.3/D1.3M-18 ..... Structural Welding Code - Sheet Steel.

D. ASTM International (ASTM):

A36/A36M-19 .....Standard Specification for Carbon Structural Steel.

A653/A653M-20 .....Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

E119-20 .....Standard Test Methods for Fire Tests of Building Construction and Materials.

E. FM Global (FM):

1-28-15 .....Wind Design.

Factory Mutual Research Approval Guide.

F. Master Painters Institute (MPI):

No. 18.....Primer, Zinc Rich, Organic.

G. Steel Deck Institute (SDI):

No. 31-07.....Design Manual for Composite Deck, Form Decks, and Roof Decks.

H. UL LLC (UL):

Listed Online Certifications Directory.

580.....Tests for Uplift Resistance of Roof Assemblies.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. All items indicated below are required submittals requiring Contracting Officer's Representative (COR) review and approval.

B. Submittal Drawings:

1. Show layout, connections to supporting members, anchorage, sump pans, accessories, deck openings and reinforcements.
2. Show similar information necessary for completing installation as shown and specified, including supplementary framing, ridge and valley plates, cant strips, cut openings, special jointing or other accessories.
3. Show welding, side lap, closure, deck reinforcing and closure reinforcing details.
4. Show openings required for work of other trades, including openings not shown on structural drawings. Indicate where temporary shoring is required to satisfy design criteria.

C. Manufacturer's Literature and Data:
1. Description of each product.
2. Show steel decking section properties and structural characteristics.

D. Sustainable Construction Submittals:
1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

E. Certificates: Certify each product complies with specifications.
1. Fire Resistance Product Listing: For each metal deck type and thickness supporting concrete slab or fill.
2. Show steel decking is UL Listed for specified application.

F. Qualifications: Substantiate qualifications comply with specifications.
1. Welders and welding procedures.

1.5 QUALITY ASSURANCE

A. FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual Global and are listed in “Factory Mutual Research Approval Guide” for “Class 1” fire rated construction.

B. Welders and Welding Procedures Qualifications: AWS D1.3/D1.3M.

1.6 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design steel decking and accessories according to AISI S100.

1. Wind Uplift Resistance and Corner Conditions:
a. Eave Overhang: 2.1 kPa (45 per square foot), minimum.
b. Other Roof Areas: 1.4 kPa (30 per square foot), minimum.
2. Fire Resistance: ASTM E119; as component of 1 hour rated roof assembly.
3. Design side and end closures and attachment to supporting steel to safely support wet weight of concrete and construction loads.
4. Cantilever Closure Deflection: 3 mm (1/8 inch), maximum.

2.2 MATERIALS

A. Galvanized Steel Sheet: ASTM A653/A653M; G60 coating.

B. Steel Shapes: ASTM A36/A36M.

2.3 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Sustainable Construction Requirements:

1. Steel Recycled Content: 30 percent total recycled content, minimum.

2.4 METAL ROOF DECK

A. Metal Roof Deck: UL Listed as metal roof deck panels.

1. Steel decking of the type, depth, thickness, and section properties as shown.

B. Metal Roof Deck: Single pan fluted units with flat horizontal top surfaces as permanent support for superimposed loads.

1. Deck Style:

a. Wide Rib (Type B) deck.

b. Intermediate Rib (Type F) deck.

2. Depth and Thickness: As indicated on drawings.

3. Material: Galvanized sheet steel.

C. Do not use steel deck for hanging supports of building components including suspended ceilings, electrical light fixtures, plumbing, heating, or air conditioning pipes or ducts or electrical conduits.

2.5 FABRICATION

A. Fabricate steel decking in sufficient lengths to extend over 3 or more supports, except for interstitial levels.

1. Cut metal deck units to proper length in shop.

B. Fabricate accessories required to complete installation of steel decking.

1. Exposed to View: Fabricate from sheet steel matching metal decking.

2. Concealed from View: Fabricate from galvanized sheet steel.

C. Sheet Metal Accessories:

1. Metal Cover Plates: For end-abutting decking, to close gaps at changes in deck direction, columns, walls and openings.

a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.

2. Continuous Sheet Metal Edging: At openings, concrete slab edges and roof deck edges.

a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.

3. Metal Closure Strips: For openings between decking and other construction. Form to configurations required to provide tight-fitting closures at open ends of flutes and sides of decking.

a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.

4. Ridge and Valley Plates: Minimum 100 mm (4 inch) wide ridge and valley plates where roof slope exceeds 1/24 (1/2 inch per foot).

a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.

5. Cant Strips: Provide bent metal 45 degree leg cant strips where indicated on the drawings. Fabricate cant strips with minimum 125 mm (5 inch) face width.
   a. Sheet Steel: Minimum 0.8 mm (0.03 inch) thick.
6. Seat Angles for Deck: Provide where beam does not frame into column.
7. Sump Pans for Roof Drains: Fabricated from single piece galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain. Provide sump pans of adequate size to receive roof drains and with bearing flanges minimum 75 mm (3 inches) wide. Recess pans minimum 38 mm (1-1/2 inches) below roof deck surface, unless otherwise shown or required by deck configuration. Drain holes will be field cut.
   a. Sheet Steel: Minimum 1.7 mm (0.06 inch) thick.

2.6 ACCESSORIES

A. Primer: Manufacturer's standard primer compatible with finish painting specified in Section 09 91 00, PAINTING.
B. Welding Materials: AWS D1.1, type to suit application.
C. Galvanizing Repair Paint: MPI No. 18.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
B. Protect existing construction and completed work from damage.
C. Remove contaminates from structural steel surfaces where steel decking will be welded.
D. Verify structural steel framing installation is completed, plumbed, and aligned with temporary bracing installed where required.
E. Coordinate with structural steel erector to prevent overloading of structural members when placing steel decking for installation.

3.2 ERECTION

A. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace deck units that become damaged after erection and before casting concrete at no cost additional to the Government.
B. Place steel decking at right angles to supporting members with ends located over supports.
C. Lap end joints 50 mm (2 inches), minimum.

D. Roof Deck Fastening: As indicated on drawings,

E. Touch up damaged factory finishes.
   1. Apply galvanizing repair paint to damaged galvanized surfaces.

END OF SECTION

DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES
SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies wood blocking, framing, sheathing, furring, nailers, rough hardware, and light wood construction.

1.2 SUMMARY

A. This Section includes the following:
   1. Wood framing, furring, grounds, nailers, and blocking.
   2. Framing with Fire Treated wood products.

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Section 01 33 00 “Submittals”.

B. Product Data for the following products:
   1. Pressure Treated wood products.
   2. Fire Treated wood products.

C. 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's (ALSC) Board of Review.

D. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:
   1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
   2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.

E. Warranty of chemical treatment manufacturer for each type of treatment.

F. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence the following products' compliance with building code in effect for Project:
   1. Engineered wood products.

G. Shop Drawings showing framing connection details, fasteners, connections and dimensions.

H. Manufacturer’s Literature and Data:
   1. Submit data for lumber, panels, hardware and adhesives.
   2. Submit data for wood-preservative treatment from chemical treatment manufacturer and certification from treating plants that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

I. Manufacturer’s certificate for unmarked lumber.

J. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility for engineered wood products: Obtain each type of engineered wood product from one source and by a single producer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

1.7 WARRANTY

A. Construction Warranty: FAR Clause 52.246-21, "Warranty of Construction"

1.8 PRE-INSTALLATION MEETINGS

A. Preinstallation Conference: Contractor to schedule conference at Project site.
   1. Review special inspection and testing and inspecting agency procedures for field quality control, and concrete protection.
   2. Meeting is to occur minimum of 2 weeks prior to installation. Owner, Architect & Manufacturer's Representative to attend.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect lumber and other products from dampness both during and after delivery at site.

B. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.

C. Stack plywood and other board products so as to prevent warping.

D. Locate stacks on well drained areas, supported at least 152 mm (6 inches) above grade and cover with well-ventilated sheds having firmly constructed over hanging roof with sufficient end wall to protect lumber from driving rain.

1.10 QUALITY ASSURANCE

A. Installer: A firm with a minimum of three (3) years' experience in the type of work required by this section.

1.11 GRADING AND MARKINGS

A. Any unmarked lumber or plywood panel for its grade and species will not be allowed on VA Construction sites for lumber and material not normally grade marked, provide manufacturer's certificates (approved by an American Lumber Standards approved agency) attesting that lumber and material meet the specified the specified requirements.

1.12 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.

B. American Forest and Paper Association (AFPA):

NDS-15	National Design Specification for Wood Construction
WCD1-01	Details for Conventional Wood Frame Construction

C. American Institute of Timber Construction (AITC):

A190.1-07	Structural Glued Laminated Timber

D. American Society of Mechanical Engineers (ASME):

B18.2.1-12(R2013)	Square and Hex Bolts and Screws
B18.2.2-10	Square and Hex Nuts
B18.6.1-81(R2008)	Wood Screws

E. American Plywood Association (APA):

E30-11	Engineered Wood Construction Guide

F. ASTM International (ASTM):

A653/A653M-13	Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
C954-11	S teel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 inch (2.24 mm) to 0.112-inch (2.84 mm) in thickness
C1002-14	Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Metal Studs
D198- 14	Test Methods of Static Tests of Lumber in Structural Sizes
D6111-13a	Test Method for Bulk Density and Specific Gravity of Plastic Lumber and Shapes by Displacement
F844-07a(R2013)	Washers, Steel, Plan (Flat) Unhardened for General Use
F1667-13	Nails, Spikes, and Staples

G. American Wood Protection Association (AWPA): AWPA Book of Standards

H. Commercial Item Description (CID):

A-A-55615	Shield, Expansion (Wood Screw and Lag Bolt Self Threading Anchors)

I. Environmental Protection Agency (EPA):

40 CFR 59(2014)	National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

J. Truss Plate Institute (TPI):

TPI-85	Metal Plate Connected Wood Trusses

K. U.S. Department of Commerce Product Standard (PS)

PS 1-95	Construction and Industrial Plywood
PS 20-10	American Softwood Lumber Standard

L. ICC Evaluation Service (ICC ES):

AC09	Quality Control of Wood Shakes and Shingles
AC174	Deck Board Span Ratings and Guardrail Systems (Guards and Handrails)

PART 2 - PRODUCTS

2.1 LUMBER

A. Unless otherwise specified, each piece of lumber must bear grade mark, stamp, or other identifying marks indicating grades of material, and rules or standards under which produced.

1. Identifying marks are to be in accordance with rule or standard under which material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.
2. Inspection agency for lumber approved by the Board of Review, American Lumber Standards Committee, to grade species used.

B. Structural Members: Species and grade as listed in the AFPA NDS having design stresses as shown.

C. Lumber Other Than Structural:
1. Unless otherwise specified, species graded under the grading rules of an inspection agency approved by Board of Review, American Lumber Standards Committee.
2. Framing lumber: Minimum extreme fiber stress in bending of 7584 kPa (1100 PSI).
3. Furring, blocking, nailers and similar items 101 mm (4 inches) and narrower Standard Grade; and, members 152 mm (6 inches) and wider, Number 2 Grade.
4. Board Sub-flooring: Shiplap edge, 25 mm (1 inch) thick, not less than 203 mm (8 inches) wide.

D. Sizes:
1. Conforming to PS 20.
2. Size references are nominal sizes, unless otherwise specified, actual sizes within manufacturing tolerances allowed by standard under which produced.

E. Moisture Content:
1. Maximum moisture content of wood products is to be as follows at the time of delivery to site.
a. Boards and lumber 50 mm (2 inches) and less in thickness: 19 percent or less.
b. Lumber over 50 mm (2 inches) thick: 25 percent or less.

F. Preservative Treatment:
1. Do not treat Heart Redwood and Western Red Cedar.
2. Treat wood members and plywood exposed to weather or in contact with plaster, masonry or concrete, including framing of open roofed structures; sills, sole plates, furring, and sleepers that are less than 610 mm (24 inches) from ground; nailers, edge strips, blocking, crickets, curbs, cant, vent strips and other members provided in connection with roofing and flashing materials.
3. Treat other members specified as preservative treated (PT).
4. Preservative treat by the pressure method complying with AWPA Book use category system standards U1 and T1, except any process involving the use of Chromated Copper Arsenate (CCA) or other agents classified as carcinogenic for pressure treating wood is not permitted.

2.2 PLYWOOD

A. Comply with PS 1.

B. Bear the mark of a recognized association or independent inspection agency that maintains continuing control over quality of plywood which identifies compliance by veneer grade, group number, span rating where applicable, and glue type.

C. Sheathing:
1. APA rated Exposure 1 or Exterior; panel grade CD or better.
2. Wall sheathing:
a. Minimum 9 mm (11/32 inch) thick with supports 406 mm (16 inches) on center and 12 mm (15/32 inch) thick with supports 610 mm (24 inches) on center unless specified otherwise.
b. Minimum 1200 mm (48 inches) wide at corners without corner bracing of framing.
3. Roof sheathing:
a. Minimum 9 mm (11/32 inch) thick with span rating 24/0 or 12 mm (15/32 inch) thick with span rating for supports 406 mm (16 inches) on center unless specified otherwise.
b. Minimum 15 mm (19/32 inch) thick or span rating of 40/20 or 18 mm (23/32 inch) thick or span rating of 48/24 for supports 610 mm (24 inches) on center.

2.3 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Wood-Preservative-Treated Materials:
a. Wilson Lumber
b. Hoover Treated Wood Products, Inc.

c. Viance Treated Wood
2. Metal Framing Anchors:
a. Illinois Tool Works
b. G2 National
c. Simpson Strong-Tie Company, Inc. – US product only.

2.4 LUMBER, GENERAL

A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
1. Grade of lumber: Structural Select.
2. Species: White fir or southern yellow pine.

2.5 WOOD-PRESERVATIVE-TREATED MATERIALS

A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
1. Do not use chemicals containing chromium or arsenic.

B. Pressure treat above ground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items 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 blocking, and similar concealed members in contact with masonry or concrete.

2.6 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including equipment curbs and support bases, can’t strips, bucks, Nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.

B. Power-Driven Fasteners: CABO NER-272.

C. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M)

D. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.8 ROUGH HARDWARE AND ADHESIVES

A. Anchor Bolts:
1. ASME B18.2.1 and ASME B18.2.2 galvanized, 13 mm (1/2 inch) unless shown otherwise.
2. Extend at least 203 mm (8 inches) into masonry or concrete with ends bent 50 mm (2 inches).

B. Miscellaneous Bolts: Expansion Bolts: C1D A-A-55615; lag bolt, long enough to extend at least 65 mm (2-1/2 inches) into masonry or concrete. Provide 13 mm (1/2 inch) bolt unless shown otherwise.

C. Washers
1. ASTM F844.
2. Provide zinc or cadmium coated steel or cast iron for washers exposed to weather.

D. Screws:
1. Wood to Wood: ASME B18.6.1 or ASTM C1002.
2. Wood to Steel: ASTM C954, or ASTM C1002.

E. Nails:
1. Size and type best suited for purpose unless noted otherwise. Provide aluminum-alloy nails, plated nails, or zinc-coated nails, for nailing wood work exposed to weather and on roof blocking.
2. ASTM F1667:
    a. Common: Type I, Style 10.
    b. Concrete: Type I, Style 11.
    c. Barbed: Type I, Style 26.
    d. Underlayment: Type I, Style 25.
    e. Masonry: Type I, Style 27.
    f. Provide special nails designed for use with ties, strap anchors, framing connectors, joists hangers, and similar items. Nails not less than 32 mm (1-1/4 inches) long, 8d and deformed or annular ring shank.

F. Framing and Timber Connectors:
1. Fabricate of ASTM A653/A653M, Grade A; steel sheet not less than 1.3 mm (0.052 inch) thick unless specified otherwise. Apply standard plating to steel timber connectors after punching, forming and assembly of parts.
2. Framing Angles: Angle designed with bendable legs to provide three (3) way anchors.
3. Straps:
    a. Designed to provide wind and seismic ties with sizes as shown or specified.
    b. Strap ties not less than 32 mm (1-1/4 inches) wide.
    c. Punched for fastener.
4. Timber Connectors: Fabricated of steel to shapes indicated on contract drawings.
5. Joist Ties: Mild steel flats, 5 mm by 32 mm (3/16 inch by 1-1/4 inch) size with ends bent about 30 degrees from horizontal, and extending at least 406 mm (16 inches) onto framing. Punch each end for three (3) spikes.
6. Wall Anchors for Joists and Rafters:
    a. Mild steel strap, 5 mm by 32 mm (3/16 inch by 1-1/4 inch) with wall ends bent 50 mm (2 inches), or provide 9 mm by 130 mm (3/8 inch by 5 inch) pin through strap end built into masonry.
    b. Strap long enough to extend onto three joists or rafters, and punched for spiking at each bearing.
    c. Strap not less than 101 mm (4 inches) embedded end.
7. Joint Plates:
    a. Steel plate punched for nails.
    b. Steel plates formed with teeth or prongs for mechanically clamping plates to wood.
    c. Size for axial eccentricity, and fastener loads.

G. Adhesives:
1. For field-gluing plywood to lumber framing floor or roof systems: ASTM D3498.
2. For structural laminated Wood: ASTM D2559.

2.9 METAL FRAMING ANCHORS

A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:
   1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
   2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

C. Joist Hangers: U-shaped joist hangers with 2-inch-(50-mm-) long seat and 1-1/4-inch-(32-mm-) wide nailing flanges at least 85 percent of joist depth.
   1. Thickness: 0.050 inch (1.3 mm)

D. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

2.10 FIRE TREATED WOOD

A. General: Where fire-retardant-treated wood is indicated, comply with applicable requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL; U.S. Testing; Timber Products Inspection, Inc.; or another testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Research or Evaluation Reports: Provide fire-retardant-treated wood acceptable to State Fire Marshal and for which a current model code research or evaluation report exists that evidences compliance of fire-retardant-treated wood for application indicated.

B. Interior Type A: For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:
   1. Bending strength, stiffness, and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions simulating installed conditions when tested by a qualified independent testing agency.
   2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.
   3. Contact with treated wood does not promote corrosion of metal fasteners.

C. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. Table 2304.9.1, "Fastening Schedule" in ICC's International Building Code (IBC)
2. ICC-ES evaluation report for fastener.

E. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

F. Use hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.

3.2 WOOD FRAMING INSTALLATION, GENERAL

A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Do not splice structural members between supports.

3.3 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

3.4 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:

A. Conform to applicable requirements of the following:
1. AFPA NDS for timber connectors.
2. AFPA WCD1 for nailing and framing unless specified otherwise.
3. APA for installation of plywood or structural use panels.
4. TPI for metal plate connected wood trusses.

B. Fasteners:
1. Nails.
a. Nail in accordance with the Recommended Nailing Schedule as specified in AFPA WCD1 where detailed nailing requirements are not specified in nailing schedule. Select nail size and nail spacing sufficient to develop adequate strength for the connection without splitting the members.
b. Use special nails with framing connectors.
c. For sheathing and subflooring, select length of nails sufficient to extend 25 mm (1 inch) into supports.
d. Use 8d or larger nails for nailing through 25 mm (1 inch) thick lumber and for toe nailing 50 mm (2 inch) thick lumber.
e. Use 16d or larger nails for nailing through 50 mm (2 inch) thick lumber.
f. Select the size and number of nails in accordance with the Nailing Schedule except for special nails with framing anchors.
g. Nailing Schedule; Using Common Nails:
1) Joist bearing on sill or girder, toe nail three (3) 8d nails or framing anchor.
2) Bridging to joist, toe nail each end two (2) 8d nails.
3) Ledger strip to beam or girder three (3) 16d nails under each joint.
4) Subflooring or Sheathing:
a) 152 mm (6 inch) wide or less to each joist face nail two (2) 8d

nails.

b) Subflooring, more than 152 mm (6 inches) wide, to each stud or joint, face nail three (3) 8d nails.

c) Plywood or structural use panel to each stud or joist face nail 8d, at supported edges 152 mm (6 inches) on center and at intermediate supports 254 mm (10 inches) on center. When gluing plywood to joint framing increase nail spacing to 305 mm (12 inches) at supported edges and 508 mm (20 inches) o.c. at intermediate supports.

5) Sole plate to joist or blocking, through sub floor face nail 20d nails, 406 mm (16 inches) on center.
6) Top plate to stud, end nail two (2) 16d nails.
7) Stud to sole plate, toe nail or framing anchor. Four (4) 8d nails.
8) Doubled studs, face nail 16d at 610 mm (24 inches) on center.
9) Built-up corner studs 16d at 610 mm (24 inches) (24 inches) on center.
10) Doubled top plates, face nails 16d at 406 mm (16 inches) on center.
11) Top plates, laps, and intersections, face nail two (2) 16d.
12) Continuous header, two pieces 16d at 406 mm (16 inches) on center along each edge.
13) Ceiling joists to plate, toenail three (3) 8d or framing anchor.
14) Continuous header to stud, four (4) 16d.
15) Ceiling joists, laps over partitions, face nail three (3) 16d or framing anchor.
16) Ceiling joists, to parallel rafters, face nail three (3) 16d.
17) Rafter to plate, toe nail three (3) 8d or framing anchor. Brace 25 mm (1 inch) thick board to each stud and plate, face nail three (3) 8d.
18) Built-up girders and beams 20d at 812 mm (32 inches) on center along each edge.

2. Bolts:
   a. Fit bolt heads and nuts bearing on wood with washers.
   b. Countersink bolt heads flush with the surface of nailers.
   c. Embed in concrete and solid masonry or provide expansion bolts. Special bolts or screws designed for anchor to solid masonry or concrete in drilled holes may be used.
   d. Provide toggle bolts to hollow masonry or sheet metal.
   e. Provide bolts to steel over 2.84 mm (0.112 inch, 11 gage) in thickness. Secure wood nailers to vertical structural steel members with bolts, placed one at ends of nailer and 610 mm (24 inch) intervals between end bolts. Provide clips to beam flanges.
3. Drill Screws to steel less than 2.84 mm (0.112 inch) thick.
   a. ASTM C1002 for steel less than 0.84 mm (0.033 inch) thick.
   b. ASTM C954 for steel over 0.84 mm (0.033 inch) thick.
4. Power actuated drive pins may be provided where practical to anchor to solid masonry, concrete, or steel.
5. Do not anchor to wood plugs or nailing blocks in masonry or concrete. Provide metal plugs, inserts or similar fastening.
6. Screws to Join Wood:
   a. Where shown or option to nails.
   b. ASTM C1002, sized to provide not less than 25 mm (1 inch) penetration into anchorage member.
   c. Spaced same as nails.
7. Installation of Timber Connectors:
   a. Conform to applicable requirements of the AFPA NDS.
   b. Fit wood to connectors and drill holes for fasteners so wood is not split.

C. Set sills or plates level in full bed of mortar on masonry or concrete walls.
1. Space anchor bolts 1219 mm (4 feet) on centers between ends and within 152 mm (6 inches) of end. Stagger bolts from side to side on plates over 178 mm (7 inches) in width.
2. Provide shims of slate, tile or similar approved material to level wood members resting on concrete or masonry. Do not use wood shims or wedges.
3. Closely fit, and set to required lines.

D. Cut notch, or bore in accordance with AFPA WCD1 passage of ducts wires, bolts, pipes, conduits and to accommodate other work. Repair or replace miscut, misfit or damaged work.

E. Blocking Nailers, and Furring:
1. Install furring, blocking, nailers, and grounds where shown.
2. Provide longest lengths practicable.
3. Provide fire retardant treated wood blocking where shown at openings and where shown or specified.
4. Layers of Blocking or Plates:
   a. Stagger end joints between upper and lower pieces.
   b. Nail at ends and not over 610 mm (24 inches) between ends.
   c. Stagger nails from side to side of wood member over 127 mm (5 inches) in width.

G. Roof Framing:
1. Metal plate connected truss as shown on project drawings.
2. Install temporary and permanent bracing as shown on truss shop drawings.

H. Partition and Wall Framing:
1. Provide 50 mm by 101 mm (2 inch by 4 inch) studs spaced 406 mm (16 inches) on centers; unless otherwise indicated on contract documents.
2. Install double studs at openings and triple studs at corners.
3. Installation of sole plate:
   a. Anchor plates of walls or partitions resting on concrete floors in place with expansion bolts, one (1) near ends of piece and at intermediate intervals of not more than 1219 mm (4 feet) or with power actuated drive pins with threaded ends of suitable type and size, spaced 610 mm (2 feet) on center unless shown otherwise.
   b. Nail plates to wood framing through subfloor as specified in nailing schedule.
4. Headers or Lintels:
   a. Make headers for openings of two (2) pieces of 50 mm (2 inch) thick lumber of size shown with plywood filler to finish flush with face of studs or solid lumber of equivalent size.
   b. Support ends of headers on top of stud cut for height of opening. Spike cut stud to adjacent stud. Spike adjacent stud to header.
5. Provide double top plates, with members lapped at least 610 mm (2-feet) spiked together.
6. Install intermediate cut studs over headers and under sills to maintain uniformity of stud spacing.
7. Provide single sill plates at bottom of opening unless otherwise indicated in contract documents. Toe nail to end stud, face nail to intermediate studs.
8. Install 50 mm (2 inch) blocking for firestopping so that maximum dimension of any concealed space is not over 2438 mm (8 feet) in accordance with AFPA WCD1.
9. Install corner bracing when plywood or structured use panel sheathing is not used.
   a. Let corner bracing into exterior surfaces of studs at an angle of approximately 45 degrees, extended completely over walls plates, and secured at bearing with two (2) nails.
   b. Provide 25 mm by 101 mm (1 inch by 4 inch) corner bracing.

I. Sheathing:
1. Provide plywood or structural-use panels for sheathing.
2. Lay panels with joints staggered, with edge and ends 3 mm (1/8 inch) apart and nailed over bearings as specified.
3. Set nails not less than 9 mm (3/8 inch) from edges.
4. Install 50 mm by 101 mm (2 inch by 4 inch) blocking spiked between joists, rafters and studs to support edge or end joints of panel

END OF SECTION

DIVISION 6 – WOOD, PLASTICS. AND COMPOSITES
SECTION 06 20 00 - FINISH CARPENTRY

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Interior standing and running trim for field-painted finish.

B. Related Sections include the following:
   1. Section 06 10 00 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for structural wood decking and framing exposed to view.
   2. Section 09 91 00 "Painting" for priming and backpriming of finish carpentry.

1.2 DEFINITIONS

A. Inspection agencies, and the abbreviations used to reference them, include the following:
   1. NELMA - Northeastern Lumber Manufacturers Association.
   2. NHLA - National Hardwood Lumber Association.
   3. NLGA - National Lumber Grades Authority.
   4. RIS - Redwood Inspection Service.
   5. SCMA - Southern Cypress Manufacturers Association.
   6. SPIB - Southern Pine Inspection Bureau.
   7. WCLIB - West Coast Lumber Inspection Bureau.
   8. WWPA - Western Wood Products Association.

1.3 SUBMITTALS

A. Product Data: Each type of process and factory-fabricated product. Include construction details, material descriptions, dimensions of individual components and profiles, textures, and colors.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
   2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Samples for Initial Selection: Color charts consisting of actual materials in small sections for trim and moulding type of material indicated.

C. Samples for Verification:
   1. For each species and cut of lumber and panel products with nonfactory-applied finish, with 1/2 of exposed surface finished, 50 sq. in. for lumber and 8 by 10 inches for panels.
   2. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (203 by 250 mm) for panels.

D. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of five (5) years of experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following (Georgia Products per General Conditions):
   1. Plywood:
      a. Georgia-Pacific Corp.
      b. Hardel Mutual Plywood Corp.
      c. Louisiana-Pacific Corporation.
      d. South Coast Lumber Co.
      e. Weyerhaeuser
      f. S.D.S. Lumber, LLC.

2.2 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by the American Lumber Standards' Committee Board of Review.
   1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.

B. Softwood Plywood: DOC PS 1.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Water-Repellent Preservative Treatment by Nonpressure Process: AWPA N1.
   1. Preservative Chemicals: 3-iodo-2-propynyl butyl carbamate (IPBC), combined with insecticide containing chloropyrifos.
   2. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
   3. Application: Exterior trim and wood siding.

2.4 INTERIOR STANDING AND RUNNING TRIM

A. Softwood Lumber Trim for Transparent Finish (Stain or Clear Finish): Kiln-dried finished lumber (S4S) of the following species and grades:
   1. Grade C Select eastern white pine; NELMA or NLGA.

B. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish): Clear, Grade A finish, kiln-dried, clear pine, fir or red oak.

C. Moldings: Made to patterns included in WMMPA WM 7. Wood moldings made from kiln-dried stock and graded under WMMPA WM 4.
   1. Moldings for opaque Finish: N-grade pine or fir, clear.
      a. Provide material selected for compatible clear grain.

2.5 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
   1. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153/A 153M.

B. Glue: Aliphatic- or phenolic-resin wood glue recommended by manufacturer for general carpentry use.

C. Flashing: Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim" for flashing materials installed in finish carpentry.
1. Horizontal Joint Flashing for Siding: Preformed prefinished aluminum Z-shaped flashing.

D. Sealants: Comply with requirements in Section 07 92 00 "Joint Sealants & Gasketing" for materials required for sealing siding work.

2.6 FABRICATION

A. Wood Moisture Content: Comply with requirements of specified inspection agencies and with manufacturer's written recommendations for moisture content of finish carpentry at relative humidity conditions existing during time of fabrication and in installation areas.

B. Back out or kerf backs of the following members, except members with ends exposed in finished work:
1. Interior standing and running trim, except shoe and crown molds.

C. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

C. Seal lumber for exterior applications to be painted, including both faces and edges. Cut to required lengths and seal ends. Comply with requirements in Section 09 91 00"Painting."

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation. Subparagraph below, based on NFPA 101 requirements, is an example only. Revise if more stringent tolerances are required. Coordinate with framing requirements for stairs in Section 06 10 00 "Rough Carpentry" Section.
4. Coordinate finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

1. Match color and grain pattern across joints.
2. Install trim after gypsum board joint finishing operations are completed.
3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.
4. Fit exterior joints to exclude water. Apply flat grain lumber with bark side exposed to weather.

3.5 ADJUSTING

A. Replace finish carpentry that is damaged or does not comply with requirements. Finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION

DIVISION 6 – WOOD, PLASTICS. AMD COMPOSITES
SECTION 06 40 00 – INTERIOR ARCHITECTURAL WOODWORK

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Laminate-clad cabinets (plastic-covered casework and/or millwork).
   2. Solid-surface countertops.

1.2 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to Section 01 33 00 “Submittals”.

B. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

C. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other Sections.
   3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.
   4. Show counter top seams (if required due to geometry).

D. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
   1. Plastic laminates.

E. Samples for verification of the following:
   1. Laminate-clad panel products, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with separate samples of un-faced panel product used for core.
   2. Exposed cabinet hardware, one unit for each type and finish.

F. Product certificates signed by woodwork fabricator certifying that products comply with specified requirements.

G. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

H. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work.

B. Installer Qualifications: Arrange for interior architectural woodwork installation by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this Project.

C. Single-Source Responsibility for Fabrication and Installation: Engage a qualified woodworking firm

to assume undivided responsibility for fabricating, finishing, and installing woodwork specified in this Section.

D. Quality Standard: Except as otherwise indicated, comply with the following standard:
1. AWI Premium Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grades of interior architectural woodwork, construction, finishes, and other requirements.
a. Provide AWI Certification Labels or Certificates of Compliance indicating that woodwork meets requirements of grades specified.

E. Fire-Test-Response Characteristics: Provide materials with the following fire-test-response characteristics as determined by testing identical products per ASTM test method indicated below by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify fire-retardant-treated material with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
1. Surface-Burning Characteristics: Not exceeding values indicated below, tested per ASTM E 84 for 30 minutes with no evidence of significant combustion. In addition, the flame front shall not progress more than 10-1/2 feet (3.2 m) beyond the center line of the burner at any time during the test.
a. Flame Spread: 25.
b. Smoke Developed: 450.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.

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.

1.6 WARRANTY

A. Construction Warranty: FAR Clause 52.246-21, “Warranty of Construction”

1.7 PRE-INSTALLATION MEETINGS

A. Preinstallation Conference: Contractor to schedule conference at Project site.
1. Review special inspection and testing and inspecting agency procedures for field quality control, and concrete protection.

2. Meeting is to occur minimum of 2 weeks prior to installation. Owner, Architect & Manufacturer's Representative to attend.

PART 2 – PRODUCTS

2.1 WOODWORK FABRICATORS

A. Fabricators: Subject to compliance with requirements, provide interior architectural woodwork by custom fabricator conforming to AWI Standards.

B. All casework and/or millwork shall be supplied complete with all hardware for installation indicated, including all hanging rails and brackets, slides, guides, pulls, and anchorages.

2.2 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:
1. Particleboard: (MWPCP) ANSI A208.1, Grade 1-M-3, 45 pound density, per cubic foot, 7% moisture content, with phenol-formaldehyde resins.
2. Softwood Plywood: PS 1, exterior grade for counters in wet locations.
3. Exposed Edge Material: Solid, high impact, acid resistant, polyvinyl chloride (PVC), machine applied with hot-melt adhesives and automatically trimmed, buffed, and corner radiused for uniform appearance.
   a. Front Panels and Doors: 1/8" (3 mm) minimum.
   b. Work Surfaces: 1/8" (3 mm) minimum.

B. High-Pressure Decorative Laminate: Melamine Plastic Laminate, NEMA LD 3-1995, grades as indicated, or if not indicated, as required by woodwork quality standard, antibacterial and aseptic.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated in the Work include, but are not limited to, the following:
   a. Wilsonart. (Basis for Design)
   b. Others as provided by Architect

C. Adhesive for Bonding Plastic Laminate: Contact cement, Aliphatic resin & Resorcinol are acceptable.

D. High Pressure Plastic Laminate, NEMA LD3-1995, GS50 grade for exterior of cabinet surfaces.
1. Substrate: (MWPCP).
2. Color: As selected by Architect from full line of standard colors.

E. Solid Surface:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering solid surface materials that may be incorporated in the Work include, but are not limited to, the following:
   a. Dupont (Basis for Design)

2.3 CABINET HARDWARE AND ACCESSORY MATERIALS

A. Cabinet Hardware: Refer to schedule at end of this Section for cabinet hardware required for architectural cabinets.

B. Hardware Standard: Comply with BHMA A156.9 for items indicated by reference to BHMA numbers or referenced to this standard.

C. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA code number indicated.
1. BHMA 626 for brass or bronze base; BHMA 652 for steel base.
2. Finish selected by Architect from:
   a. Satin Chrome.

b. Polished Brass.

D. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9.

2.4 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

B. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.
1. Metal framing supports; provide screws as recommended by metal-framing manufacturer.

C. 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 bolt devices for drilled-in-place anchors.

2.5 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:
1. Grade: Custom.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
1. Corners of cabinets and edges 3/4 inch (19 mm) thick or less: 1/16 inch (1.5 mm).
2. Edges of rails and similar members more than 3/4 inch (19 mm) thick: 1/8 inch (3 mm).
3. Corners of cabinets and edges of members and rails: 1/16 inch (1.5 mm).
4. Side, Shelf, Front and back Carcass Panels shall be 3/4" thick.
5. Base Cabinet and Wall Cabinet Attachment Rails: 3/4" MWPCP; continuous length of cabinet.
6. Drawers: Manufacturer’s standard design constructed of 5/8" thick bottom panel and standard front and rear panels to match adjacent doors with metal drawer slides
7. Tops: 1/2" thick
   a. Solid-Surface
      1) Coordinate cutout for plumbing fixtures with Division 22.
      2) Seal all cutouts and exposed edges.
8. Concealed Support Base: Fully concealed rigid 4" high and 3/4" thick MWPCP base fabricated with two continuous runners with bridging at 24 inches o.c. Provide steel leveling shoes at each corner for level adjustment.
9. Fasteners and Anchors: Types, sizes, material, and finish for condition of use.
   a. Cabinet attachment screws FS FF-S-111.
   b. 7/16" diameter head, 1 1/4” minimum.
   c. Coordinate with substrate to be anchored to.

D. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
1. Trial fit assemblies at the 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 approved shop drawings before disassembling for shipment.

E. Hardware:
1. Panel Assembly Pins: Minfix RTA fasteners, to provide ease of disassembly.
2. Solo fasteners for back panels, removable.
3. Keku fasteners for kickplates.
4. Hinges, minimum 2 per door, self-closing, clip-on (94°). Provide reveal and lifetime warranty.
5. Drawer glides: See Hardware Schedule at end of this section.
6. Adjustable Shelf Supports: Spoon-shaped for 3/16" diameter holes.
7. Hardware finish: Brushed chrome finish.

F. Shop-cut openings to maximum extent possible to receive hardware, appliances, fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

2.6 LAMINATE-CLAD CABINETS (PLASTIC-COVERED CASEWORK AND/OR MILLWORK)

A. Quality Standard: Comply with AWI Section 400 requirements for laminate-clad cabinets.

B. AWI Type of Cabinet Construction: Reveal overlay.
1. Reveal Dimension: 1/2 inch (13 mm).

C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
1. Horizontal Surfaces Other than Tops: GP-50, 0.050-inch (1.270-mm) nominal thickness.
2. Vertical Surfaces: GP-28, 0.028-inch (0.711-mm) nominal thickness.
3. Edges: Solid PVC edge banding (1/8") nominal thickness (Drawer and door edges). Color accent to coordinate with laminate.

D. Materials for Semi-exposed Surfaces: Provide surface materials indicated below:
1. Surfaces Other than Drawer Bodies: High-pressure decorative laminate, Grade GP-28.
2. Drawer Sides and Backs: Thermoset decorative overlay.
3. Drawer Bottoms: Thermoset decorative overlay.

E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. Provide Architect's selections from laminate manufacturer's full range of colors and finishes.

2.7 COUNTERTOPS

A. Quality Standard: Comply with AWI Section 400 requirements for countertops.

B. Type of Top:
1. Solid Surface
a. Thickness: 1/2” thick, 1 ½” thick at exposed edge/bullnose.
b. Colors, Patterns, and Finishes: Provide materials and products from manufacturer's full range of colors and finishes.
c. Edge Treatment: Solid-surface integrated bull-nose – ¾” radius top edge, 3/8” radius bottom edge
d. Provide all insulation as required per manufacturer at openings for heat-producing or refrigeration equipment.

PART 3 – EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8" in 96" for plumb and level (including tops).

C. Scribe & cut woodwork to fit adjoining work & refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

E. Cabinets: Install without distortion so that 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 the installation of hardware and accessory items as indicated.
1. Install cabinets with no more than 1/8" in 96" sag, bow, or other variation from a straight line.

F. Tops: Anchor securely to base units and other support systems as indicated. Caulk space between backsplash and wall with specified sealant.
1. Install countertops with no more than 1/8" in 96" sag, bow, or other variation from a straight line.
2. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c.
3. Solid Surface backsplashes & tops to be integral.

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.

3.4 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

3.5 CABINET HARDWARE AND ACCESSORY SCHEDULE

A. BHMA numbers are used below to designate hardware requirements, except as otherwise indicated.

B. Concealed (European Type) Hinges: B01602 (94°). **Hinges to be Salice C2JBA99-B2R3E39 with reduction clip (90°) or approved equal.**

C. Pulls: Wire pulls, 4" inches long, 5/16 inches (8 mm) in diameter.

D. Catches: As follows: Magnetic Catches: B03141.

E. Adjustable Shelf Standards: B04071.
1. Shelf Rests for Standards: B04081.

F. Shelf Rests: B04013.

G. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, complying with BHMA A156.9, Grade 1 and rated for the following loads:
1. Box Drawer Slides: 100 lbf (440 N).

H. Wire Grommet: 2" Ø, provide 1-per space/workstation.

I. All drawers and door fronts shall be constructed to receive locks. Project manager to determine keying.

END OF SECTION

DIVISION 7 - THERMAL AND MOISTURE PROTECTION
SECTION 07 16 00 - BITUMINOUS WATERPROOFING & DAMPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Below-grade wall dampproofing.
2. Cavity wall dampproofing.

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Section 03 30 00 “Cast-in-Place Concrete” for concrete placement, curing, and finishing.
2. Section 04 20 00 “Unit Masonry” for cavity wall materials.
3 Section 07 92 00 "Joint Sealants & Gasketing" for joint sealant materials and installation.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide waterproofing that prevents the passage of liquid water under hydrostatic pressure and complies with requirements as demonstrated by testing performed by an independent testing agency of manufacturer's current sheet or elastomeric membrane.

1.3 SUBMITTALS

A. Product Data for each type of waterproofing specified, including manufacturer's printed instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties.

B. Installer certificates signed by manufacturer certifying that Installers comply with requirements under the "Quality Assurance" Article.

C. Product test reports from a qualified independent testing agency evidencing compliance of waterproofing with requirements and other physical properties reported by manufacturer based on comprehensive testing of products according to current standard test methods within previous 5 years.

D. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who is certified in writing by waterproofing manufacturer as qualified to install manufacturer's waterproofing.

B. Installer Qualifications: Engage an Installer who has completed waterproofing similar to that indicated for this Project and who is acceptable to waterproofing manufacturer.

C. Single-Source Responsibility: Obtain waterproofing materials from a single manufacturer regularly engaged in manufacturing waterproofing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Apply dampproofing within range of ambient and substrate temperatures

recommended by waterproofing manufacturer. Do not apply dampproofing to a damp or wet substrate.

1. Do not apply in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article 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 Subcontractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty signed by waterproofing manufacturer and Installer agreeing to repair or replace waterproofing that does not meet requirements or that does not remain watertight during the specified warranty period. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch (1.6 mm) in width.

1. Warranty Period: 5 years after date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the following:

1. Rubberized-Asphalt Damproofing material:
   a. Karnak Corporation.
   b. W.R. Meadows, Inc.
   c. Pecora Corporation.
2. Fluid applied membrane by spray or roller.

2.2 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with waterproofing sheet membrane.

1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.

B. Primer: Liquid primer recommended by manufacturer of sheet waterproofing material for substrate.

C. Sheet Flashing: Self-adhering, rubberized-asphalt composite sheet of same material, construction, and thickness as waterproofing sheet membrane.

D. Liquid Membrane: Elastomeric, 2-component, liquid, cold fluid-applied, trowel grade or low viscosity as recommended by waterproofing manufacturer for application.

E. Patching Membrane: Low-viscosity, 2-component, asphalt-modified coating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which waterproofing systems will be applied, with Installer present, for compliance with requirements. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. Do not proceed with installation until after minimum concrete curing period recommended by waterproofing manufacturer.
2. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Notify Architect in writing of anticipated problems using waterproofing over substrate.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage affecting other construction.

C. Remove grease, oil, form release agents, paints, and other penetrating contaminants from concrete or masonry.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrate. Remove dust and dirt from joints and cracks according to ASTM D 4258.
   1. Install membrane strip and center over construction and control joints and cracks exceeding a width of 1/16 inch (1.6 mm).

F. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to waterproofing manufacturer's written instructions.

3.3 PROTECTING AND CLEANING

A. Protect damproofing from damage and wear during application and remainder of construction period, according to manufacturer's written instructions.

B. Protect installed work from damage due to ultraviolet light exposure, physical abuse, and other causes. Provide temporary coverings where work will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

DIVISION 7 - THERMAL & MOISTURE PROTECTION
SECTION 07 21 00 – THERMAL AND ACOUSTIC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Cavity wall insulation.
   2. Concealed building insulation.
   3. Sound attenuation in stud walls.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 09 29 00 “Gypsum Board Assemblies” indicated below for insulation installed as part of metal-framed wall and partition assemblies:

1.2 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of insulation product specified.

C. Product test reports from and based on tests performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.

D. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.

B. All products must be fully BABAA Compliant. Submit Certificate of BABAA Compliance with Manufacturer’s Product Certification Letter on Manufacturer's letterhead.

C. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products 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: ASTM E 84.
   2. Fire-Resistance Ratings: ASTM E 119.
   3. Combustion Characteristics: ASTM E 136.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation

B. Protect plastic insulation as follows:
   1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.

3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.5 WARRANTY

A. Manufacturer warranty to cover product from date of installation to life of the building. Warranty to provide replacement of non-performing material, assuming product was installed properly. See manufacture's written warranty for complete details.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering insulation products that may be incorporated in the work include, but are not limited to, the following:
   1. Extruded Board Insulation:
      a. CertainTeed Corporation.
      b. Owens-Corning Fiberglas Corporation.
      c. Johns Manville Corporation (JM)
      d. Kingspan

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.
   1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Extruded-Polystyrene Board Insulation: Rigid, cellular polystyrene thermal insulation formed from polystyrene base resin by an extrusion process using hydrochlorofluorocarbons as blowing agent to comply with ASTM C 578 for type and with other requirements indicated below: (Below slab and cavity wall installations)
   1. Type V, 3-lb/cu. ft. (48-kg/cu. m) minimum density.
   2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 75 and 450, respectively.
   3. Recycled Content: Not less than 50 percent blend of postconsumer and recovered polystyrene resins.

C. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core formed by using hydrochlorofluorocarbons as blowing agent and faced on both sides to comply with referenced standards and with other requirements indicated below: (Roof)
   1. Federal Standard: FS HH-I-1972/1, Class 1 (nonreinforced core) or 2 (reinforced core).
   2. ASTM Standard: ASTM C 1289, Type I, Class 1 or 2.
   3. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 75 and 450, respectively, based on tests performed on unfaced core on thicknesses up to 4 inches (101 mm).
   4. Thermal Resistivity: 7.2 deg F x h x sq. ft./Btu x in. at 75 deg F (50 K x m/W at 24 deg C).
   5. Conform to roofing system manufacturer's requirements.

D. Unfaced Mineral-Fiber Blanket Insulation: Sound attenuation insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type I (blankets without membrane facing for stud walls and ceilings).
   1. Mineral-Fiber Type: Fibers manufactured from glass, slag wool, or rock wool.
   2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
   3. R-19

E. Foamed-in-Place Core Insulation: Injected Foam cellular thermal insulation, two components amino-plast resin and catalyst foaming agent surfactant, propelled by compressed air into masonry core. Material shall have Class A fire rating, free of CFC's formaldehyde, and petrochemical compounds. Minimum R-Value of 4.8/in. Inject in all non-reinforced cores of masonry units. Provide material

from one of the following manufacturers:
1. Tailored Chemical Products, Inc. – "Core-Fill 500 Foam Insulation".
2. Tripolymer. – "Tripolymer Foam Insulation".
3. Handi-Foam – "Fomo Foam".

F. Sound attenuation batts: thermofiber batt for stud wall cavity. (All stud walls)

2.3 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.

C. Extend insulation in thickness indicated 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. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness (such as required for roof).

3.4 INJECTED CAVITY FOAM INSULATION

A. Drill and pressure inject masonry cavity foam in CMU cores.

B. Spray apply closed-cell foam on interior face of CMU exterior wall (provide complete coverage & protect with gypsum wallboard).

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates 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.

B. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.

1. Tape joints and ruptures in vapor retarder and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

D. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
   1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
   2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3.6 PROTECTION

A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

DIVISION 7 – THERMAL & MOISTURE PROTECTION
SECTION 07 41 10 – STANDING SEAM METAL ROOFING

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Prefinished galvanized steel standing locked-seam roof panels.
   2. Flashing, Rake, eave and trim closures.

B. Related Sections include the following:
   1. Section 07 62 00 "Sheet Metal Flashing and Trim" for flashing not part of roofing and other sheet metal work.
   2. Section 07 71 23 “Gutters and Downspouts”
   3. Section 07 92 00 “Joint Sealants and Gasketing” for field-applied sealants.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide manufactured roof panel assemblies complying with performance requirements indicated and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.

B. Air Infiltration: Provide manufactured roof panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. (0.45 L/s/sq. m) of fixed roof area when tested according to ASTM E 1680 at a static-air-pressure difference of 4.0 lbf/sq. ft. (192 Pa).

C. Water Penetration: Provide manufactured roof panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 1646 at a minimum differential pressure of 20 percent of inward acting, wind-load design pressure of not less than 6.24 lb/sq. ft. (300 Pa) and not more than 12.0 lb/sq. ft. (575 Pa).

D. Wind-Uplift Resistance: Provide roof panel assemblies that meet requirements of 110 mph wind-uplift resistance per **current** IBC.

1.3 SUBMITTALS

A. Product Data: Include manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and four total panel assemblies.

B. Shop Drawings: Show layouts of panels on roofs, details of edge conditions, joints, panel profiles, supports, anchorages, trim, flashings, underlayment, closures, and special details. Distinguish between factory- and field-assembled work.
   1. For installed products indicated to comply with certain design loadings, include structural analysis data signed and sealed by the qualified professional engineer in State of Georgia responsible for their preparation.

C. Samples for Initial Selection: Manufacturer's color charts or chips showing the colors matching textures, patterns and color of available for roof panels with factory-applied finishes.

D. Samples for Verification: Provide sample panels 12 inches (300 mm) long by actual panel width, in the profile, style, color, and texture indicated. Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.

E. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Product Test Reports: Indicate compliance of manufactured roof panel assemblies and materials with performance and other requirements based on comprehensive testing of current products.

G. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: The roof system manufacturer shall meet and provide written certification stating:
1. The manufacturer has been regularly engaged in the fabrication of metal standing seam roof systems for at least 10 years. A brief list of similar projects shall be submitted with the shop drawings.
2. The manufacturer has a written warranty covering durability, color and weathertightness of its roof system.

B. Installer Qualifications: Engage an experienced installer who has completed metal roof panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated.

D. Fire-Test-Response Characteristics: Where fire-resistance-rated roof panel assemblies are indicated, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
1. Fire-Resistance Ratings: As indicated by design designations in UL's "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.

E. Design Criteria
1. The following standards and criteria shall be used where covered by this specification:
a. Galvanized metal.
b. **Current** International Building Code with State of Georgia Amendments.
c. Test for Wind Uplift Resistance of Roof Assemblies Underwriters Laboratories, Inc.
2. Design Loads
a. Design loads shall be developed using the procedures contained in commentary in the MBMA publication, *Low Rise Metal Building Systems Manual*. The following data shall be used in developing design loads in addition to dead loads:
1) Vertical Live Loads: roof system shall be designed for a 20 PSF live load.
2) Wind Loads: Basic wind speed of 110 miles per hour.
3) Other superimposed dynamic and/or static loads, shall be considered as part of the design requirements and combined with the normal design (live and wind) loads.
4) Combination of normal load and auxiliary loads for design purposes shall be as prescribed and recommended in the **current** International Building Code with State of Georgia Amendments.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver panels and other components so they will not be damaged or deformed. Package panels for protection against damage during transportation or handling.

B. Handling: Exercise care in unloading, storing, and erecting roof panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store panels to ensure dryness. Do not store panels in contact with other

materials that might cause staining, denting, or other surface damage.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify location of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish opening dimensions and proceed with fabricating roof panels without field measurements or allow for trimming panel units. Coordinate roof construction to ensure actual locations of structural members and to ensure opening dimensions correspond to established dimensions.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article 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.

B. Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal roof panels within the specified warranty period and agreeing to repair finish or replace roof panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.

C. Finish Warranty Period: 20 years from date of Architect's Final Certification.

D. Special Weathertight Warranty: Submit a written warranty executed by manufacturer agreeing to repair or replace metal roof panel assembly that fails to remain weathertight within the specified warranty period.

E. Weathertight Warranty Period: 20 years from date of Architect's Final Completion.

PART 2 – PRODUCTS

2.1 STANDING SEAM METAL ROOF SYSTEM

A. Prefinished Galvanized Metal Roof Panel, ASTM B370 cold rolled galvanized sheet - Products shall be equal or exceed the quality level specified for roof system. PVDF finish with 20 year warranty. Acceptable manufacturers subject to compliance with specified requirements are not to be limited by the following:
   1. American Building, Loc-Seam 360. (Basis of Design)
   2. Modern Steel Solutions.
   3. MBCI.
   4. American Building Components.

B. Deviations in appearance from the quality manufacturer's standard panel must be approved by the Architect before acceptance.

C. Changes in framing or variations in loading to the existing structure caused by alternate roof systems shall be subject to review and all costs for any modifications shall be the responsibility of the general contractor (Ribbed (striated) Prefinished standing seam roof panels; lapped edges; exposed fasteners)

D. System Description - The roof system is an exposed fastener metal roofing system.
   1. Roof panels shall be rolled rib design and secured to the supports with a gasketed screw structural fastening system.
   2. Roof panels shall be fastened to the support framing members with through penetration.
   3. Panel termination and perimeter flashing (attached to roof panels) shall be attached and sealed with sealants recommended by the manufacturer.
   4. Required closure trim shall match metal roofing material and profile.

2.2 MATERIALS

A. Roof panel shall have a configuration consisting of nominal 2 inch high, 16 inch wide panels with standing interlocking seam pattern. Panels shall be joined at the sidelaps with a sealed overlap seam.

B. Galvanized steel roof panels and flashing shall be 24 gauge cold rolled sheet.

C. Wall trim, metal panel lap flashing, edge trims, rake trim and all exposed components shall be galvanized steel and prefinished to match roof panels.

D. Self Adhering Polymer-Modified, Bituminous Sheet Underlayment: ASTM D 1970, minimum of 40 mils thick. Provide primer when recommended by underlayment manufacturer. Eave Protection: ASTM D 1970 sheet barrier of self-adhering rubberized asphalt membrane shingle underlayment having high traction surface, internal reinforcement, and "split" back plastic release film; provide material with warranty equal in duration to that of shingles being applied. Acceptable manufacturers:
1. Products: Subject to compliance with requirements, provide one of the following:
   a. WinterGuard: Certain Teed Corporation
   b. Moisture Guard: Tamko Asphalt Products, Inc.
   c. Jiffy Seal Ice and Water Guard: Protecto Wrap Co.
   d. Ice Guard Membrane No. 108-AG: Royston Laboratories, Inc.

E. Glass-felt Underlayment: ASTM D 2178 Type IV, asphalt impregnated glass felts.

2.3 METALS AND FINISHES

A. Prefinished galvanized steel: Sheet coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755 (ASTM A 755M) and the following requirements:
1. Thickness: 24 gauge, unless otherwise indicated.
2. Finish: Apply the following organic coating in thickness indicated. Furnish appropriate air-drying spray finish in matching color for touchup.
   a. PVDF Cool Coatings System: Manufacturer's (Kynar 500 Coating System) standard 2-coat, system film thickness of .15 mil and 25-35% percent reflective gloss when tested according to ASTM D 523.
      1) Durability: Provide coating field tested under normal range of weather conditions for a minimum of 20 years without significant peel, blister, flake, chip, crack, or check in finish; without chalking in excess of a chalk rating of 8 according to ASTM D 4214; and without fading in excess of 5 Hunter units.
      2) Color: As selected by Architect from manufacturer's full range of colors – clear anodized.

2.4 ROOF PANEL ASSEMBLIES

A. Standing-Seam Roof Panels: Manufacturer's standard factory-formed, standing-seam roof panel assembly designed for concealed mechanical attachment of panels to deck.
1. Clips: Provide minimum 0.0625-inch- (1.6-mm-) thick, stainless-steel or hot-dipped galvanized panel clips designed to meet negative-load requirements locate per wind-uplift requirements.

2.5 THERMAL INSULATION

A. Rigid polyisocyanurate insulation, mechanically attached to metal decking (2-layers with offset joints).

B. Insulation materials shall conform to metal roof manufacturer’s requirements.

C. System shall provide minimum R-30 aged thermal value.

2.6 MISCELLANEOUS MATERIALS

A. General: Provide materials and accessories required for a complete roof panel assembly and as recommended by panel manufacturer, unless otherwise indicated.

B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
1. Use stainless-steel fasteners for exterior applications and galvanized steel fasteners for interior applications.
2. Provide metal-backed neoprene washers under heads of exposed fasteners bearing on weather side of panels. Use concealed fastening methods.
3. Where exposed fasteners are necessary, locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.

C. Accessories: Unless otherwise specified, provide components required for a complete roof panel assembly including trim, coping, fascia, mullions, ridge closures, clips, seam covers, battens, flashing, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.
1. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
2. Elastomeric Joint Sealant: ASTM C 920, of base polymer, type, grade, class, and use classifications required to seal joints in panel roofing and remain weathertight. Provide sealant recommended by panel manufacturer.

D. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 7-mil (0.2-mm) dry film thickness per coat, unless otherwise indicated. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

E. Ridge Vent: Screened and flashed continuous prefinished metal ridge vent with cap, flashing and counter-flashing. Provide integral water dam. Minimum 22 gauge cap.

2.7 FABRICATION

A. Field Measurements:
1. The sheet metal fabricator is responsible for details and dimensions controlled by the drawings and by existing conditions. Make field measurements for verification of these dimensions.
2. The roof installer and sheet metal fabricator shall cooperate to establish and maintain these dimensions.

B. General Metal Fabrication:
1. Shop-fabricate work to greatest extent possible.
2. Comply with details shown, and with applicable requirements of SMACNA Manual.

C. Forming:
1. Form sheet metal work accurately to the sizes and profiles required to fit substrates.
2. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated.
3. Form sheet metal work in maximum lengths and keep joints to a minimum.
4. Maximum length of drips: 10'.
5. Maximum length of all other flashing metal: 16'

D. Joining:
1. Use fasteners as recommended by roofing system manufacturer and as shown on approved shop drawings. Use fasteners of type and spacing in accordance with the SMACNA Manual, except as otherwise indicated by manufacturer. Space as required to secure metals straight and true to line.

2. Form lock and slip joints in accordance with the SMACNA Manual. Joints are to be made so that slight adjustments of the metal work can be made and at the same time remain watertight.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of metal panel roofing.
   1. Panel Supports and Anchorage: Examine roof framing and insulation to verify that other secondary structural panel support members have been installed according to written instructions of panel manufacturer.
   2. Do not proceed with roof panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate metal panel roofing with rain drainage work; flashing; trim; and construction of structural systems, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

B. Promptly remove protective film, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.

3.3 PANEL INSTALLATION

A. General: Comply with panel manufacturer's written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
   1. Field cutting exterior panels by torch is not permitted.
   2. Install panels with concealed fasteners, unless otherwise indicated.

B. Accessories: Install components required for a complete roof panel assembly including trim, copings, fascia, ridge & hip closures, clips, seam covers, battens, flashings, sealants, gaskets, fillers, closure strips, and similar items.

C. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.

D. Coat back side of metal panels with bituminous coating where it will contact wood, ferrous metal, or cementitious construction.

E. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not otherwise indicated, types recommended by panel manufacturer.
   1. Seal panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by panel manufacturer.
   2. Prepare joints and apply sealants to comply with requirements of Section 07 92 00 "Joint Sealants & Gasketing"

F. Standing-Seam Roof Panel Assembly: Fasten panels to supports with concealed clip according to panel manufacturer's written instructions.
   1. Install clips with self-drilling/self-tapping fasteners through insulation to metal purlins.
   2. At end laps of panels, install sealant tape calk between panels.
   3. Install factory-seals at standing-seam joints. Locking panel and roll seam to provide a weathertight joint.

4. Seaming: Complete seaming of panel joints by operating portable power-driven equipment of type recommended by panel manufacturer to provide a weathertight joint.

G. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.4 CLEANING AND PROTECTING

A. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

B. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION

DIVISION 7 – THERMAL & MOISTURE PROTECTION
SECTION 07 46 10 – COMPOSITE LAPPED SIDING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Composite wood trim, fascia and accessories.

1.2 RELATED SECTIONS

A. Section 06 10 00 “Rough Carpentry”.

B. Section 07 21 00 “Thermal and Acoustic Insulation”.

1.3 REFERENCES

A. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets

B. ASTM D3359 - Standard Test Method for Measuring Adhesion by Tape Test, Tool and Tape.

C. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00 “Submittals”.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches (100 by 150 mm), representing actual product, color, and patterns.

F. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.

B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Prior to installation, Contractor to attend Pre-Installation Conference with Architect. Contractor to notify Architect ten (10) days prior to scheduled installation.

1.8 WARRANTY

A. Product Warranty: Limited, non-pro-rated product warranty.
1. Soffit panels: for 30 years.
2. Trim: for 15 years.

B. Finish Warranty: Limited product warranty against manufacturing finish defects.
1. When used for its intended purpose, properly installed and maintained according to published installation instructions, for a period of 15 years from the date of purchase: will not peel; will not crack; and will not chip. Finish warranty includes the coverage for labor and material.

C. Workmanship Warranty: Installer’s application limited warranty for 2 years from date of Final Acceptance.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:
1. James Hardie Building Products, Inc.
2. Louisiana Pacific, Corp.
3. Versatex Building Products.
4. AZEK Exteriors.

B. Substitutions: As approved by Architect.

C. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01 60 00 “Product Requirements”.

2.2 SIDING

A. Trim:
1. HardieTrim HZ5 boards and HardieTrim HZ boards as manufactured by James Hardie Building Products, Inc.
2. HardieTrim HZ5 Fascia boards as manufactured by James Hardie Building Products, Inc.
3. HardieTrim HZ5 Crown moulding manufactured by James Hardie Building Products, Inc.
4. Artisan HZ5 Accent trim as manufactured by James Hardie Building Products, Inc.
5. See drawings for exact profiles

2.3 SOFFIT AND TRIM

A. HardieSoffit Vented Smooth HZ5 panels requirement for Materials:
1. Complies with ASTM C 1186 Type A Grade II.

2. Complies with ASTM E 136 as a noncombustible material.
3. Complies with ≈STM E 84 Flame Spread Index = 0, Smoke Developed Index = 5.
4. National Evaluation Report No. NER 405 (BOCA, ICBO, SBCCI, IBC, IRC).
5. US Department of Housing and Urban Development Materials Release 1263d.

B. Trim:
1. Fascia Board HardieTrim HZ5.

2.4 FASTENERS

A. Wood Framing Fasteners: Contractor to use Manufacturer's recommended fasteners.

2.5 FINISHES

A. Factory Primer: Provide factory applied universal primer.
1. Primer: Factory primed by manufacturer.
2. Topcoat: Refer to Section 09 91 00 "Painting" and 01 60 00 "Product Requirements".

B. Finishes to be field-applied. Color to be selected by Architect.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If framing preparation is the responsibility of another installer, notify Architect & General Contractor of unsatisfactory preparation before proceeding.

C. Nominal 2 inch by 4 inch (51 m by 102 mm) wood framing selected for minimal shrinkage and complying with local building codes, including the use of water-resistive barriers or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.
1. Install water-resistive barriers and claddings to dry surfaces.
2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
3. Protect siding from other trades.

D. Minimum 20 gauge 3-5/8 inch (92 mm) C-Stud 16 inches maximum on center or 16 gauge 3-5/8 inches (92 mm) C-Stud 24 inches (610 mm) maximum on center metal framing complying with local building codes, including the use of water-resistive barriers and/or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.
1. Install water-resistive barriers and claddings to dry surfaces.
2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
3. Protect siding from other trades.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

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

C. Install a water-resistive barrier is required in accordance with local building code requirements.

D. The water-resistive barrier must be appropriately installed with penetration and junction flashing in accordance with local building code requirements.

E. Use Seam Tape at joint and laps.

F. Install flashing, and Flex Flashing

3.3 INSTALLATION - HARDIETRIM HZ5 BOARDS

A. Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.

B. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch (19 mm) or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.

C. Place fasteners no closer than 3/4 inch (19 mm) and no further than 2 inches (51 mm) from side edge of trim board and no closer than 1 inch (25 mm) from end. Fasten maximum 16 inches (406 mm) on center.

D. Maintain clearance between trim and adjacent finished grade.

E. Trim inside corner with a single board trim both side of corner.

F. Outside Corner Board: Attach Trim on both sides of corner with 16-gauge corrosion resistant finish nail 1/2 inch (13 mm) from edge spaced 16 inches (406 mm) apart, weather cut each end spaced minimum 12 inches (305 mm) apart.

G. Allow 1/8 inch gap between trim and siding.

H. Seal gap with high quality, paint-able caulk/sealant.

I. Shim frieze board as required to align with corner trim.

J. Fasten through overlapping boards. Do not nail between lap joints.

K. Overlay siding with single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten Trim boards to Trim boards.

L. Shim frieze board as required to align with corner trim.

M. Install Trim Fascia boards to rafter tails or to sub fascia boards & blocking.

3.4 FINISHING

A. Finish unprimed siding with a minimum one coat high quality, alkali resistant primer and one coat of either, 100 percent acrylic or latex or oil based, exterior grade topcoats or two coats high quality alkali resistant 100 percent acrylic or latex, exterior grade topcoat within 90 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

B. Finish factory primed siding with a minimum of one coat of high quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

3.5 PROTECTION

A. Protect installed products until completion of project.

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

END OF SECTION

DIVISION 7 - THERMAL & MOISTURE PROTECTION
SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes sheet metal flashing and trim in the following categories:
   1. Metal flashing, counter-flashing and copings.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 07 92 00 "Joint Sealants & Gasketing" for elastomeric sealants.

1.2 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to Section 01 33 00 “Submittals”.

B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

C. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.

D. Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.
   1. 8-inch square Samples of specified sheet materials to be exposed as finished surfaces.

E. Provide a specimen of manufacturers maintenance requirements with submittal.

F. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.4 PROJECT CONDITIONS

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has complete sheet metal flashing and trim work in similar material, design for a minimum of five years and with a record of successful in-service performance.

B. Warranty: Provide warranty in which installer agrees to repair or replace components of sheet metal flashing and trim that fail in materials or workmanship within five years from date of substantial completion.
   1. Provide single combined roof membrane & metal flashing s warranty. 20 year period.

PART 2 - PRODUCTS

2.1 METALS

A. Stainless-Steel Sheet (concealed locations only): ASTM A 167, Type 304, soft annealed, with No. 2D finish, except where harder temper is required for forming or performance; minimum 0.0187 inch (0.5

mm) thick, unless otherwise indicated.

B. Prefinished Sheet Metal
1. Where indicated on Drawings.
2. Minimum 0.032" (0.5 mm) thick, unless otherwise indicated.
3. Formed to shape and size as indicated.
4. Comply with "SMACNA Architectural Handbook".
5. Conform to dimensions and profiles shown unless more stringent requirements are indicated.
6. Prefinished Aluminum Sheet: ASTM B 209, Type 3003 or 3004 H14; minimum 0.032" (0.5 mm) thick, Kynar finish.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Solder for Stainless Steel: ASTM B 32, Grade Sn60, used with an acid flux of type recommended by stainless-steel sheet manufacturer; use a noncorrosive rosin flux over tinned surfaces.

B. Fasteners: Same metal as sheet metal flashing or noncorrosive stainless steel as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

C. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, nondrying, non-migrating sealant.

D. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07 92 00 “Joint Sealants & Gasketing".

E. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

F. Paper Slip Sheet: 5-pound/square red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.

G. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

2.3 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim fit substrates and result in waterproof and weather-resistant performance once installed. Sheet metal fabricator is responsible for details and dimensions controlled by the drawings; and shall make filed measurements for verification of these dimensions. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

E. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

F. Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact w/asphalt mastic or other permanent separation as recommended by manufacturer.

G. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on

faces of sheet metal exposed to public view.

H. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.4 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Downspouts: Fabricate from the following material: Aluminum, 0.125 inch thick.

C. Conductor Heads: Fabricate from: Aluminum 0.050 inch thick.

D. Exposed Trim, Drips, and Fascia: Fabricate from the following material: Aluminum: 0.050 inch thick.

E. Copings: Fabricate from the following material: Aluminum: 0.050 inch thick.

F. Flashing: Fabricate from the following material: Aluminum: 0.050 inch thick.

G. Counterflashing: Fabricate from the following material: Aluminum: 0.050 inch thick.

H. Roof-Penetration Flashing:
1. Aluminum flanged with boot for pipes.
a. Band with stainless steel clamp and seal top.

I. Confirm with Architect which fabricated pieces to have applied Kynar.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal 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 weatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. 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 inch, except where pre-tinned surface would show in finished 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.

D. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal

sealant.

1. Use joint adhesive for nonmoving joints specified not to be soldered.

E. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

F. Separations: Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
2. Bed flanges of Work in a thick coat of sealant where required for waterproof performance.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions, ensure sheet metal flashing and trim work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION

DIVISION 7 – THERMAL & MOISTURE CONTROL
SECTION 07 71 23 – GUTTERS AND DOWNSPOUTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes sheet metal flashing and trim in the following categories:
   1. Roof gutters and downspout systems.
   2. Exposed trim, drips, and fascia.
   3. Collectors.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 07 92 00 "Joint Sealants and Gasketing" for elastomeric sealants.

1.2 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal gutters and downspouts to withstand wind loads, structural movement, dynamic water loads, thermally induced movement, and exposure to weather without failing.

B. Fabricate and install fascia systems at roof edges to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for the following wind zone:
   1. Wind Zone 1: Wind pressures of 10 to 20 psf (0.48 to 0.96 kPa).

C. Conform with **current** IBC, three (3) second gust wind speeds, 110mph.

1.3 SUBMITTALS

A. General: Submit each item in this Section according to Section 01 33 00 “Submittals”.

B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

C. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.

D. Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.
   1. 8-inch square Samples of specified sheet materials to be exposed as finished surfaces.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Provide a specimen of manufacturers maintenance requirements with submittal.

G. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance over a minimum five year period.

1.5 PROJECT CONDITIONS.

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 METALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:
   1. Aluminum Sheet: ASTM B 209 (ASTM B 209M), 5005-H14, with a minimum thickness of 0.050 inch (1.2 mm).
      a. Color shall be selected by the Architect from manufacturer's standard colors

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Southern Aluminum Finishing Company, Inc.(SAF) (Basis of Design),
      a. Roman Profile Collector Head. In-Line application and independent collector.
      b. Extruded downspout, size 4"x5" or as indicated on drawings, .125" thickness.
      c. Concealed gutter shall be aluminum with 8" Roman Profile (SAF).
      d. Provide formed prefinished extenders as detailed, .050" minimum thickness.
      e. Provide pre-finished vented soffit panels as detailed.
      f. Provide closure cleats as indicated and required.
   2. Fry Reglet Corporation, custom fabricated shapes to match shapes and systems indicated.
   3. Hickman custom fabricated shapes to match shapes and systems indicated.
   4. Copper Craft, custom fabricated shapes to match shapes and systems indicated.

C. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing lower edge.
   1. Material: Aluminum, 0.024 inch (0.6 mm) thick, minimum.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

B. Mastic Sealant: Polyisobutylene; nonhardening, non-skinning, nondrying, nonmigrating sealant.

C. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07 92 00 "Joint Sealants and Gasketing"

D. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.

E. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

F. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness sized for performance.

2.3 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

E. Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

F. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

G. Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact with non-asphaltic permanent separation as recommended by manufacturer.

H. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

I. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
   1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.4 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Downspouts: Fabricate from the following material: Aluminum, 0.125 inch thick.

C. Conductor Heads: Fabricate from: Aluminum 0.050 inch thick.

D. Exposed Trim, Drips, and Fascia: Fabricate from the following material: Aluminum: 0.050 inch thick.

E. Copings: Fabricate from the following material: Aluminum: 0.050 inch thick.

F. Flashing: Fabricate from the following material: Aluminum: 0.050 inch thick.

G. Counterflashing: Fabricate from the following material: Aluminum: 0.050 inch thick.

2.5 ALUMINUM EXTRUSION FABRICATIONS

A. Aluminum Extrusion Units: Fabricate extruded-aluminum running units with formed or extruded-aluminum joint covers for installation behind main members where possible. Fabricate mitered and welded corner units.

2.6 ALUMINUM FINISHES

A. General: Comply with Aluminum Association's (AA) "Designation System for Aluminum Finishes" for finish designations and application recommendations.

B. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.
   1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal 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 weatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.

D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

E. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant. Use joint adhesive for nonmoving joints specified not to be soldered.

F. Seams: Fabricate nonmoving seams in aluminum with flat seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

G. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
   1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
   2. Bed flanges of Work in a thick sealant bed for waterproof performance.

H. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches (50 mm) and bed with sealant.

I. Roof-Drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA's Manual or the item manufacturer.

J. Splash Blocks: Install where downspouts discharge on-grade. Provide positive drainage away from building and slope grade below for full support. Excavate and install (2) cubic ft. of River Rock at edge, flush with grade.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Mechanical completion.

END OF SECTION

DIVISION 7 - THERMAL & MOISTURE PROTECTION
SECTION 07 84 00 - FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes firestopping for the following:
   1. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
   2. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
   3. Sealant joints in fire-resistance-rated and smoke-resistive construction.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 07 92 00 “Joint Sealants & Gasketing” for non-fire-resistive-rated joint sealants.
   2. Division 23 sections specifying ducts and piping penetrations.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases. Work shall be performed by a single subcontractor for all firestopping systems. Installer shall be “Certified” and “Trained” by the material manufacturer.

B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings as determined per ASTM E 814, not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.

C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupied floor areas. T-rated assemblies are required where the following conditions exist:
   1. Where firestop systems protect penetrations located outside of wall cavities.
   2. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.
   3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
   4. Where firestop systems protect penetrating items larger than a 4-inch-diameter nominal pipe or 16 sq. in. in overall cross-sectional area.

D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.

E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
   1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
   2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

F. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

C. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration approved by firestopping manufacturer's fire protection engineer with modifications marked.

D. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements. Provide certificates of Installer’s training by the received from the firestopping material manufacturer.

E. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.

F. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience.

G. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.
3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements:
a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.

B. Installer Qualifications: Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements.

C. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.

D. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."

E. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.

B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

1.7 SEQUENCING AND SCHEDULING

A. Do not cover up those firestopping installations that will become concealed behind other construction until Architect and authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

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

B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming/damming/backing materials including the following:
    a. Semi-refractory fiber (mineral wool) insulation.
    b. Ceramic fiber.
    c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
    d. Joint fillers for joint sealants.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.2 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

A. Ceramic-Fiber and Mastic Coating: Ceramic fibers in bulk form formulated for use with mastic coating, and ceramic fiber manufacturer's mastic coating.

B. Ceramic-Fiber Sealant: Single-component formulation of ceramic fibers and inorganic binders.

C. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.

D. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.

E. Intumescent Putty: Nonhardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.

G. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.

H. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogenous mortar.

I. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

J. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.

K. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/ gunnable sealant, unless indicated firestop system limits use to non-sag grade for both opening conditions.
   2. Grade for Horizontal Surfaces: Pourable (self-leveling) grade for openings in floors and other horizontal surfaces.
   3. Grade for Vertical Surfaces: Non-sag grade for openings in vertical and other surfaces.

L. Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer-based sealant of grade indicated below:
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/ gunnable sealant, unless indicated firestop system limits use to non-sag grade for both opening conditions.
   2. Grade for Horizontal Surfaces: Pourable (self-leveling) grade for openings in floors and other horizontal surfaces.
   3. Grade for Vertical Surfaces: Non-sag grade for openings in vertical and other surfaces.

M. Products: Subject to compliance with requirements, provide fire stopping systems from:
   1. **Hilti Construction Chemicals, Inc.** (866) 445-8827
      5400 South 122nd East Avenue
      Tulsa, OK 74146

2.3 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to

fire-resistive joint sealants.

B. Sealant Colors: Provide color of exposed joint sealants to comply with the following:
1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

C. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, & joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.
1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage changes in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
a. 50% movement in both extension & compression for a total of 100% movement.

D. Multicomponent, Non-sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.
1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage change in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
a. 40% movement in extension & 25% in compression for a total of 65% movement.
b. 50% movement in both extension & compression for a total of 100% movement.

2.4 MIXING

A. Those products requiring mixing prior to application, comply w/firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

B. Priming: Prime substrates where recommended by firestopping 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 firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestop seal with substrates.

3.3 INSTALLING THROUGH-PENETRATION FIRESTOPS

A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begin. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.5 LABELING

A. Label both sides of all fire rated walls above ceiling to identify fire “Time Rating” of wall assembly. Self-adhered lettering is not acceptable, conform to Section 09 91 00 “Painting”. Conform with NFPA 101 L/S Code and **current** IBC with Georgia Amendments. Reference paragraph 703.7 Marking and Identification: Where there is an accessible concealed floor, floor-ceiling or attic space, fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling in the concealed space.

B. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
1. The words: "Warning: Through Penetration Firestop System – Do Not Disturb. Notify Building Management of Any Damage.”
2. Contractor's name, address and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.

4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

C. A firestop documentation manager software shall be used to document, track, and maintain the passive firestop systems throughout the construction and maintenance phase of the facility. The software solution shall be used to track and document every firestop system installed on the project and each subsequent addition, change, or removal of the firestop system. The firestop documentation shall be managed with a cloud-based software which allows the installer to use a standard smartphone or tablet device (either iOS, Android or Windows capable) to capture the relevant information for the installation. The following data shall be tracked for each penetration within the facility: product installed, system installed, date of installation, location of the penetration including a notation on the 2D plan image, F-rating, name of installer, photo (pre-installation and post-installation), and inspection status. The Owner and/ or Construction Manager may designate additional items to be tracked. The firestop documentation manager software must perform the following basic functions:
1. Create multiple projects/ facilities, add/create/ remove users for each project, upload documents including UL systems, 2D floor plans, product data, engineering judgments, etc.
2. Define data to track using pre-defined input fields or creating custom input fields as desired.
3. Capture multiple photos for each penetration, including a pre-installation and post-installation photo.
4. Scan QR Code on Hilti identification label to link the program data to a specific penetration location.
5. Annotate (mark) location of penetration on 2D floor plan.
6. Create reports by filtering data and utilizing report templates.
7. Online/ offline (for use in areas where data service is unavailable) synchronization of data between mobile device, online application and cloud-based system.
8. Ability to transfer ownership of projects from one customer to another from construction phase to facility maintenance.

D. Permanently attach Hilti identification labels to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove or change penetrating items or firestopping. Labels shall have a unique QR code for each penetration which can be scanned by the firestop documentation software to quickly identify the penetration attributes.
1. Acceptable Software: Hilti CFS-DM, from Hilti Inc., Plano, TX. Tel (800) 879-8000 website: www.us.hilti.com
2. Substitutions: Not permitted.
3. Single Source: Obtain firestop documentation manager software and firestop systems for each type of penetration and construction condition indicated only from a single manufacturer.

3.6 CLEANING

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

B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

END OF SECTION

DIVISION 7 – THERMAL & MOISTURE PROTECTION
SECTION 07 92 00 – JOINT SEALANTS & GASKETING

PART 1 – GENERAL

1.1 SUMMARY

A. This section consists of furnishing of all labor, materials, equipment and related items for all sealants and caulking, as indicated on the drawings or specified herein.

B. Required applications of sealants include, but are not necessarily limited to, the following general locations:
1. Joints between different materials.
2. Perimeter joints between materials and frames of doors and windows.
3. Control joints on exposed interior surfaces of exterior walls.
4. Perimeter joints of exterior openings.
5. Perimeter joints between interior wall surfaces and frames of interior doors, and windows.
6. Joints between adjoining construction & different materials.
7. Exterior expansion joints.
8. Roof flashings, joints and reglets.
9. Moving joints.
10. All sealant work not specifically mentioned in other sections, but required to provide a neat appearance and weathertight construction.

1.2 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 “Submittals”:
1. Manufacturer's Data: Submit manufacturer's name, specifications, recommendations and installation instructions for each type of sealant, caulking compound and associated material required.
2. Include manufacturer's published data, or letter of certification, or certified test laboratory report indicating that each material complies with the requirements and is intended generally for the applications shown.
3. Samples, Sealants and Caulking: Submit 3, 12" long samples of each color required (except black) for each type of sealant or caulking compound exposed to view. Install sample between 2 strips of material similar to or representative of typical surfaces where sealant or compound will be used, held apart to represent typical joint widths. Samples will be reviewed by Architect for color and texture only. Compliance with other requirements is the exclusive responsibility of the Contractor.
4. Color Samples. Submit manufacturer's standard palette of caulking and sealant colors for selection by the Architect. Sealant shall match adjacent material.

B. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.3 PRODUCT DELIVERY

A. Deliver materials to the site in unbroken containers.

1.4 QUALITY ASSURANCE

A. Obtain elastomeric sealant materials from manufacturers who will, if required, send a qualified technical representative to project site, for the purpose of advising the Installer of proper procedures and precautions for the use of the materials.

B. Installer: A firm with a minimum of five (5) years successful experience in the application of the types of materials required.

1.5 JOB CONDITIONS

A. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

B. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

C. Inspection: The Installer must examine the joint surfaces, backing, and anchorage of units forming sealant rabbet, and the conditions under which the sealant work is to be performed, and notify the Contractor in writing of conditions detrimental to proper and timely completion of work and performance of the sealants.

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

1.6 WARRANTY (GUARANTEE)

A. Sealant Warranty: Provide written warranty, signed by Contractor and Installer; agreeing to, within warranty period, replace/repair defective materials and workmanship defined to include:
1. Instances of significant leakage of water or air.
2. Failures in joint adhesion, material adhesion, abrasion resistance, migration resistance, strain resistance, or general durability.

B. Warranty includes responsibility for removal and replacement of other work (if any) which conceals or obstructs the replacement of sealants.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

A. Colors. Colors of caulking and sealant materials will be selected by the Architect.

B. Compatibility: Before selection and purchase of each specified sealant, investigate its compatibility with the joint surfaces, joint fillers and other materials in the joint system. Provide only materials (manufacturer's recommended variation of the specified materials) which are known to be fully compatible with the actual installation conditions, as shown by manufacturer's published data or certification.

2.2 TWO-COMPONENT ELASTOMERIC SEALANTS

A. Two-Component Urethane Sealant:
1. Two-part urethane sealant complying with Type II, ASTM C-920 and ASTM D-1850, non sag recommended for exterior vertical expansion and control joints. Primers as recommended by manufacturer.
2. Provide one of the following products:
   a. Sikaflex-2C NS EZ, Sikaflex (Basis of Design)
   b. Dynatrol II, Pecora Corp.
   c. Duo-Sil, Bostik

2.3 ONE COMPONENT ELASTOMERIC SEALANTS

A. One Component Urethane Sealant: Use at exterior control and expansion joints. ASTM C920, Class 25, Type S, Grade NS. Provide one of the following products:
1. Pecora - Dynatrol II
2. Sika: SikaFlex NP1
3. Sikaflex 1A by Sika
4. S1000 Dymonic FC by Tremco

2.4 LATEX ACRYLIC JOINT SEALANTS

A. General: Provide manufacturer's standard one-part, nonsag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

B. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.

C. Products: Subject to compliance with requirements, provide one of the following:
1. Acrylic-Emulsion Sealant:
   a. "AC-20+ Sealant," Pecora Corp.
   b. “Dynaflex 230”, Dap
   c. "Tremflex 834," Tremco, Inc.
2. Silicone-Emulsion Sealant:
   a. "Dowsil," Dow Corning Corp.

2.5 SOLVENT-RELEASE-CURING JOINT SEALANTS.

A. Acrylic Sealant: Manufacturer's standard one-part, non-sag, solvent-release-curing acrylic terpolymer sealant complying with AAMA 808.3 or FS TT-S-00230C or both, with capability when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage change in joint width existing at time of application and remain adhered to joint substrates indicated for Project without failing cohesively:
1. 12-1/2 percent movement in both extension and compression for a total of 25 percent.

B. Butyl Sealant: Manufacturer's standard one-part, non-sag, solvent-release-curing, polymerized butyl sealant complying with ASTM C 1085 and formulated with minimum of 75 percent solids to be non-staining, paintable, and have a tack-free time of 24 hours or less.

C. Pigmented Narrow Joint Sealant: Manufacturer's standard, solvent-release-curing, pigmented synthetic rubber sealant complying with AAMA 803.3 and formulated for sealing joints 3/16 inch or smaller in width.

D. Products: Subject to compliance with requirements, provide one of the following:
1. Acrylic Sealant:
   a. "Dynatrol 1 XL Hybrid," Pecora Corp.
2. Butyl Sealant:
   a. "BC-158," Pecora Corp.
3. Urethane Sealant:
   a. "Vulkem 116”, Tremco

2.6 SILICONE SEALANT

A. Silicone Emulsion Sealant: Provide product complying with ASTM C834 and, except for weight loss measured per ASTM C 792, with ASTM C920 that accommodates joint movement of not more than 25 percent in both extension and compression for a total of 50 percent.
1. Silicone sealant Manufacturer’s: (Exterior, integral color, grade NS Type S)
   a. Dow Corning 795.

b. Pecora; 864.
c. Momentive; SilPruf SCS9000 NB.
d. Tremco; Spectrem 1.

2. Conform to selected sealant manufacturer's recommended system in each application.

2.7 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Open-cell polyurethane foam.
2. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, non-outgassing in un-ruptured state.
3. Proprietary, reticulated, closed-cell polymeric foam, non-outgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 gms/cc per ASTM C 1083.
4. Any material indicated above.

C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F (-32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

2.8 MISCELLANEOUS MATERIALS

A. Joint Cleaner. Provide the type of joint cleaning compound recommended by the sealant or caulking compound manufacturer, for the joint surfaces to be cleaned.

B. Joint Primer/Sealant: Provide the type of joint primer/sealer recommended by the sealant manufacturer, for the joint surfaces to be primed or sealed.

C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to the substrate or joint filler must be avoided for performance of sealant. Provide self-adhesive tape where applicable.

D. Sealer Backer Rod: Compressible non-absorptive material as recommended for compatibility with sealant by the sealant manufacturer. Provide size and shape of rod which will control the joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide a highly compressible backer to minimize the possibility of sealant extrusion when joint is compressed.

E. 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.

F. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

G. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

H. Pre-molded joint fillers: Williams Products, Inc.
1. Backer Rod.
2. Gasket.
3. Ceramic filler.

PART 3 – EXECUTION

3.1 SYSTEM SELECTION

A. Sealant System. Use for all exterior work.

3.2 PREPARATORY WORK

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

B. Protection. Prior to priming, apply masking tape to adjacent surfaces. Leave masking tape in place until tooling operation is complete.

3.3 JOINT SURFACE PREPARATION

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

B. For elastomeric sealants, do not proceed with installation of sealant over joint surfaces which have been painted, lacquered, waterproofed or treated with water repellent or other treatment or coating unless a laboratory test for durability (adhesion), has successfully demonstrated that sealant bond is not impaired by the coating or treatment. If laboratory test has not been performed, or shows bond interference, remove coating or treatment from joint surfaces before installing sealant.

C. Clean concrete and masonry joint surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance.

D. Install sealant backer rod except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.

E. Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.

F. Install sealants to depths as recommended by the sealant manufacturer. Caulk or seal all joints where indicated or required for a complete and approved installation.

G. Spillage: Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces including rough textures. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or the sealant/caulking compound.

H. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply

primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

I. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.4 APPLICATION

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Back-up: Install back-up material to proper depth in joints. Use back-up material of suitable size and shape, so that when compressed (25 to 50%), it will fit in joints as required. When using back-up of hose or rod stock, roll the material into the joint to avoid lengthwise stretching. Do not twist or braid hose or rod stock. Use bond-breaker strip in all joints where sufficient room for back-up material does not exist.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   a. Do not leave gaps between ends of joint fillers.
   b. Do not stretch, twist, puncture, or tear joint fillers.
   c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

D. Backer Rods and Tape:
1. For 3/16-inch or wider joints, install backer rod for sealants, except where recommended to be omitted by sealant manufacturer for indicated application.
2. For joints 3/16-inch or wider, install bond breaker tape where required by manufacturer's recommendations to ensure that liquid applied sealants will perform as intended.

E. Primer: Prime surface in accordance with manufacturer's recommendations, and allow to dry before applying sealing material.

F. Sealant: Follow manufacturer's instructions regarding mixing, pot life and application procedure. Do not apply sealing materials when the temperature of the material, air or substrate is below 45 degrees F. or during wet or humid weather. Apply sealing materials in full bead and force into joint.

G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

H. Deposit sealants in uniform, continuous ribbons without gaps or air pockets. Completely wet joint bond surfaces equally on opposite sides. Fill sealant rabbet to slightly concave surface, slightly below adjoining surfaces.

I. Tooling: Tool joints to compress the compound into the joint. Except as recommended by the sealing material manufacturer, do not use liquid solutions to moisten tools. Remove masking tape immediately after tooling.

J. Tooling of Non-sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

K. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

3.5 CLEANING

A. Remove excess and spillage of compound promptly as the work progresses. Clean the adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage, without damage to the adjoining surfaces or finishes. Rake joints to full width and depth. Remove loose particles present or resulting from cleaning operations by blowing out joints with oil free compressed air. All traces of bituminous materials must be removed.

B. Porous Surfaces: Clean porous surfaces, such as concrete and masonry, by grinding, blast-cleaning, mechanical abrading, acid washing or combination of these methods to provide a clean, sound base surface for caulking and sealant adhesive. Remove form oils by blast-cleaning. Insure that concrete is fully cured and free from laitance, loose aggregate and surface treatments. If surface treatments are present, test for adhesion before proceeding with sealing work.

C. Non-porous Surfaces: Clean non-porous surfaces, such as metal and glass, in accordance with system manufacturer's recommendations. Do not use solvents that leaves a residue. Apply and remove solvents with clean, white cloths. Do not allow solvents to air dry without wiping.

3.6 CURE AND PROTECTION

A. Cure sealant compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.

B. The Installer shall advise the Contractor of procedures required for the curing and protection of sealants and caulking compounds during the construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at the time of Owner's acceptance.

C. Replace or restore sealants which are damaged or deteriorated during construction period.

3.7 CAULKING & SEALANTS SCHEDULE.

A. <u>Sealants:</u>
1. Exterior: Integral Color Exterior Silicone, Type S, Grade NS, Class 50:
   a. Windows, frames & door frames.
   b. Precast Stone joints: Use “M.”
   c. Color match adjacent material.
   d. Roof flashing: Use “A.”
   e. Glazing: Use “G.”
   f. Other: Use “O.”
2. Interior: Caulking, Type S, Silicone, Grade NS, Class 50:
   a. Wet areas:
      1) Mildew resistant, Use “O.”
      2) Color match grout color & adjacent fixture colors.
   b. Painted joints: Type S, Grade NS, Class 50, Use “M, G, A & O.”
   c. Caulk all open joints & dissimilar materials.
   d. Caulk all plumbing fixtures to floor, wall & counters.

B. Reference:

Type S	Single
Type M	Multi-Component
Grade	NS
Class	50
“M”	Mortar
“G”	Glass
“A”	Aluminum
“O”	Other
Preformed Foam Sealant	

END OF SECTION

DIVISION 8 - OPENINGS
SECTION 08 11 13 – HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Steel doors, frames.
   2. Materials installation and accessories.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 04 20 00 "Unit Masonry" for building anchors into and grouting frames in masonry construction.
   2. Section 08 71 00 "Door Hardware" for door hardware and weather-stripping.
   3. Section 09 29 00 "Gypsum Board Assemblies" for spot grouting frames in gypsum board partitions.
   4. Section 09 91 00 "Painting" for field painting primed doors and frames.

1.2 SUBMITTALS

A. General: Submit each item in this Article according to Section 01 33 00 “Submittals”.

B. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

C. Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

D. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
   1. Indicate coordination of glazing frames and stops with glass and glazing requirements.

E. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.3 QUALITY ASSURANCE

A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.

B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E 152, and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to State Fire Marshal.
   1. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity

chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to promote air circulation.

1.5 WARRANTY

A. Manufacturer to repair or replace any defect in product or workmanship for one (1) year. See manufacturer's warranty for specific details.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Steel Doors and Frames:
      a. Amweld Building Products, Inc.
      b. Ceco Door Products, Trio-E Product.
      c. Curries Co.
      d. Mesker Door, Inc.
      e. Pioneer Industries.
      f. Republic Builders Products.
      g. Steelcraft. (Basis of Design) **(Welded frames)**
      h. Rediframe products, Rediflex (Basis of Design) **(Knockdown frames)**

2.2 MATERIALS

A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A 569 (ASTM A 569M).

B. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality, special killed.

C. Galvanized Steel Sheets: Zinc-coated carbon steel complying with ASTM A 526 (ASTM A 526M), commercial quality, or ASTM A 642 (ASTM A 642M), drawing quality, hot-dip galvanized according to ASTM A 525, with A 60 or G 60 (ASTM A 525M, with Z 180 or ZF 180) coating designation, mill phosphatized.

D. Supports and Anchors: Fabricated from not less than 0.0598-inch- (16 gauge) thick steel sheet; 0.0598-inch- (16 gauge) thick galvanized steel where used with galvanized steel frames. Wire anchors are not acceptable.

E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.

F. 16-gauge stainless steel door frames, brushed-US 304.

2.3 DOORS

A. Steel Doors: Provide 1-3/4" thick doors of materials and ANSI/SDI 100 grades and models specified below:
   1. Interior Doors: Grade II, heavy-duty, Model 1, flush design, minimum 0.042-inch- (16 gauge) minimum thickness, cold-rolled steel sheet faces.
   2. Exterior Doors: Grade II, heavy-duty, seamless design, minimum 0.042-inch- (16 gauge) thick galvanized steel sheet faces, with insulated core.
   3. Vertical edges: Continuous weld.
   4. Top closure: Flush closing channel, spot welded & fully sealed joints.
   5. Reinforcing: Provide minimum 12 gauge steel lock, hinge and closer reinforcement.

2.4 FRAMES

A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, according

to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules, minimum 16 gauge with concealed fastenings, fully welded with integral stops. Fabricate frames of minimum 16 gauge thick cold-rolled steel sheet.

1. 16 gauge galvannealed steel for door frames in exterior or wet locations.
2. 16-gauge non-kerf adjustable throat frame cold rolled steel for interior door frame.
3. Floor anchors: Provide minimum 16-gauge floor anchors punched for bolting to floor.

B. Door Silencers: Except on weather-stripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

C. Plaster Guards: Provide minimum 0.0179-inch- (0.45-mm-) 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.

D. Grout: Required in masonry construction, as specified in Section 04 20 00 "Unit Masonry." Grout frames in interior gypsum partitions as detailed and in conformance with tested fire rated assembly.

2.5 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. Internal Construction: One of the following manufacturer's standard core materials according to SDI standards:
   a. Rigid polyurethane conforming to ASTM C 591, Exterior doors.
   b. Mineral Core for rated and tested door assemblies.
2. Clearances: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between non-fire-rated pairs of doors. Not more than 3/4 inch at bottom.
   a. Fire Doors: Provide clearances according to NFPA 80.

B. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel sheet.

C. Tolerances: 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. Galvanized Steel Doors, Panels, and Frames: For the following locations, fabricate doors, panels, and frames from galvanized steel sheet according to SDI 112. Close top and bottom edges of doors flush as an integral part of door construction or by addition of minimum 0.0635-inch- (1.6-mm-) thick galvanized steel channels, with channel webs placed even with top and bottom edges. Seal joints in top edges of doors against water penetration.

1. At exterior locations.

F. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.

1. Provide thermal-rated assemblies with U-value rating of 0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) or better.

G. Hardware Preparation: 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.

1. For door closers, provide space, reinforcing, and provisions for fastening in top rail of doors or head of frames, as applicable.

H. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

I. 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."

J. Glazing Stops: Minimum 0.0359-inch- (0.9-mm-) thick steel.
1. Provide non-removable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
2. Provide screw-applied, removable, glazing beads on inside of glass, louvers, and other panels in doors.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes.

C. Apply primers and organic finishes to doors and frames after fabrication.

2.7 GALVANIZED STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces with nonpetroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
1. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

2.8 STEEL SHEET FINISHES

A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).

B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.

C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After

wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

1. Place frames before constructing enclosing walls and ceilings.
2. 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.
3. Install fire-rated frames according to NFPA 80.

C. Door Installation: Fit metal doors accurately in frames, within clearances specified in ANSI/SDI 100.

1. Fire-Rated Doors: Install with clearances specified in NFPA 80.
2. Smoke-Control Doors: Comply with NFPA 105.

3.2 ADJUSTING AND CLEANING

A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION

DIVISION 8 - OPENINGS
SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Solid-core doors with wood-veneer faces.
   2. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, trim for openings.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
   1. Indicate dimensions and locations of mortises and holes for hardware.
   2. Indicate dimensions and locations of cutouts.
   3. Indicate requirements for veneer matching.

C. Samples for Verification: As follows:
   1. Corner sections of doors approximately 8 by 10 inches (200 by 250 mm) with door faces and edgings representing the typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for field-finished doors.
   2. Louver blade and frame sections, 6 inches long, for each material and finish specified.
   3. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with the following standard:
   1. NWWDA Quality Standard: NWWDA I.S.1-A, "Architectural Wood Flush Doors."
   2. AWI Quality Standard: AWI's "Architectural Woodwork Quality Standards" for grade of door, core, construction, finish, and other requirements.
   3. Fire-Rated Wood Doors: Doors 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 NFPA 252.
   4. Test Pressure: Test at atmospheric pressure.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's written instructions.
   1. Individually package doors in plastic bags or cardboard cartons.

B. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags or concealed markings.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet-work is complete.

1.6 WARRANTY

A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner

of their 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.

B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form, signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4" in a 42-by-84" section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3" span, or do not comply with tolerances in referenced quality standard.
   1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
   2. Warranty shall be in effect during the following period of time after the date of Substantial Completion:
      a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Flush Wood Doors:
      a. Forte Opening Solutions
      b. VT Industries
      c Osh Kosh Door Company

2.2 DOOR CONSTRUCTION, GENERAL

A. Doors for Transparent Factory Finish: Comply with the following requirements:
   1. Grade: Premium, with Grade AA faces.
   2. Faces: Select **white** birch veneer, rotary-sliced
   3. Match: Slip & Balance matched
   4. Stiles: Same species as face.

B. Solid core doors.

C. Particleboard Cores: Comply with the following requirements:
   1. Particleboard: ANSI A208.1, Grade LD-2.
   2. Blocking: Provide fire-rated wood blocking at particleboard-core doors as follows:
      a. 5-inch (125-mm) top-rail blocking, at doors indicated to have closers.
      b. 5" bottom-rail blocking, at exterior doors & doors indicated to have kick, mop, or armor plates.

D. Interior Veneer-Faced Doors: Comply with the following requirements:
   1. Core: Particleboard core.
   2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

E. Edge Sealing
   1. Top and bottom edge of doors to be sealed, regardless of whether doors are factory or field finished.

2.3 LIGHT FRAMES

A. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet, factory primed and approved for use in doors of fire rating indicated.

B. Frame color to be selected by Architect from Manufacturer's complete catalogue.

2.4 FABRICATION

A. Fabricate flush wood doors in sizes indicated for Project site fitting.

B. 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.

C. 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.

D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind of door required.
   1. Light Openings: Trim openings with moldings of material indicated.

PART 3 - EXECUTION

3.1 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.

3.2 INSTALLATION

A. Hardware: For installation, see Section 08 71 00 "Door Hardware."

B. Manufacturer's Written Instructions: Install wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
   1. Clearances: Provide 1/8" at heads, jambs, and between pairs of doors. Provide 1/8" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold.
   2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING AND PROTECTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: 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.

END OF SECTION

DIVISION 8 - OPENINGS
SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of access doors:
   1. Interior plumbing & chase walls, access panels.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 04 20 00 “Unit Masonry” for CMU walls.

1.2 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of access door assembly specified, including details of construction relative to materials, individual components, profiles, finishes, & fire-protection ratings (if required).
   1. Include complete schedule, including types, general locations, sizes, wall and ceiling construction details, latching or locking provisions, and other data pertinent to installation.

C. Shop drawings showing fabrication and installation of customized access doors and frames, including details of each frame type, elevations of door design types, anchorage, and accessory items.

D. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.3 QUALITY ASSURANCE.

A. Single-Source Responsibility: Obtain access doors for entire Project from one source and by a single manufacturer.

1.4 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified under "Submittals" Article.

1.5 WARRANTY

A. Manufacturer guarantees product to be free of defects in material, finishes & workmanship from one (1) year from date of shipment. Warranty is limited to replacement of product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. J.L. Industries.
   2. Karp Associates, Inc.
   3. Larsen's Manufacturing Co.
   4. Milcor, Inc.
   5. Nystrom, Inc.
   6. The Williams Bros. Corporation of America.

2.2 MATERIALS

A. Steel Sheet: ASTM A 366/A 366M commercial-quality, cold-rolled steel sheet with baked-on,

rust-inhibitive primer.

2.3 ACCESS DOORS

A. Insulated, Access Doors: Self-latching units consisting of frame, trim, door, insulation, and hardware, including key lock device, interior latch release, and complying with the following requirements:
   1. Frame with Exposed Trim: Perimeter frame with integral exposed trim complying with the following requirements:
      a. Metal: 0.0598-inch- (1.52-mm-) thick steel sheet. Galvanized w/shop prime finish
      b. Trim: 1-inch (25.4-mm) flange overlapping surfaces surrounding door frame.
   2. Door: 0.0359-inch- (0.91-mm-) thick steel sheet, welded pan type.
   3. Hinges: Continuous type.
   4. Latches: Bolt type, operated by a flush key device (keyed alike).
   5. Insulation: 2-inch- (50.8-mm-) thick mineral-fiber insulation.
   6. Size: 2'-0" x 2'-0" minimum.

2.4 FABRICATION

A. General: Manufacture each access door assembly as an integral unit ready for installation.

B. Steel Access Doors and Frames: Continuous welded construction. Grind 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. Exposed Flange: Nominal 1 to 1-1/2" (25.4 to 38.1 mm) wide around perimeter of frame.
   2. Masonry opening construction.

C. Locking Devices: Furnish number required to hold door in flush, smooth plane when closed.

PART 3 - EXECUTION

3.1 PREPARATION

A. Advise Installers of other work about specific requirements relating to access door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices. Furnish inserts and anchoring devices for access doors that must be built into other construction. Coordinate delivery with other work to avoid delay.

3.2 INSTALLATION

A. Comply with manufacturer's instructions for installing access doors.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finished surfaces.

3.3 ADJUST AND CLEAN

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION

DIVISION 8 – OPENINGS
SECTION 08 33 00 – INSULATED ROLLING SERVICE DOOR

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Overhead insulated rolling doors.
   2. Operating Hardware, Tracks, and Supports.

B. Related Sections:
   1. 05 50 00 “Metal Fabrications”. Door opening jamb and head members.
   2. 06 10 00 “Rough Carpentry”. Door opening jamb and head members.
   3. 09 91 00 “Painting”. Field painting. (Structural Steel)

C. Products that may be supplied, but are not installed under this section:
   1. Control Station

1.2 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Air Infiltration to Comply With:
      a. ASHRAE® (American Society of Heating, Refrigeration, and Air-Conditioning Engineers) Standard 90.1-2007, 2010 & 2013 requirements of less than .3 CFM/FT2.
      b. IECC® (International Energy Conservation Code) 2015 requirements of less than 1.0 CFM/FT2.
   2. Wind Loading:
      a. Supply doors to withstand up to 20 psf design wind load.
   3. Cycle Life:
      a. Design doors of standard construction for normal use of up to 20 cycles per day maximum, and an overall maximum of 50,000 operating cycles for the life of the door.
   4. Seismic Performance:
      a. Provide manufacturer’s seismic calculations confirming ASCE7-10.
   5. Insulated Door Slat Material Requirements:
      a. Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84.
      b. Sound Transmission Class (STC) rating up to 30 for the curtain and up to 22 for the entire assembly. If an STC of 32 is desired, additional options are required. All configurations are evaluated per ASTM E90 and based on testing a complete, operable assembly.
      c. Minimum R-value of 8.0 (U-value of 0.125) as calculated using the ASHRAE Handbook of Fundamentals.
      d. Insulation to be CFC Free with an Ozone Depletion Potential (ODP) rating of zero.
   6. Safety:
      a. Chain operated doors shall be designed so that the door immediately stops upward or downward travel and is maintained in a stationary position when the hand chain is released by user.

1.3 SUBMITTALS

A. Reference Section 01 33 00 “Submittals”; submit the following items:
   1. Product Data: Manufacturer’s data sheets one each project to be used, including:
      a. Preparation instructions and recommendations.
      b. Storage and handling requirements and recommendations.
      c. Installation methods.

2. Shop Drawings**:** Include special conditions not detailed in Product Data. Show interface with adjacent work.
3. Quality Assurance/Control Submittals:
   a. Provide manufacturer ISO 9001:2015 registration.
   b. Provide manufacturer and installer qualifications.
   c. Provide manufacturer's installation instruction.
   d. Manufacturer must provide independent testing lab results proving .3 CFM/FT2 or less air infiltration.
4. Closeout Submittals:
   a. Operation and Maintenance Manual.
   b. Certificate stating that installed materials comply with this specification.

B. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.5 DELIVERY STORAGE AND HANDLING

A. Store products in manufacturer’s unopened labeled packaging until ready for installation.

B. Protect materials from exposure to moisture until ready for installation.

C. Store materials in a dry, ventilated weathertight location.

1.6 WARRANTY

A. Standard Warranty: Two years from date of shipment against defects in material and workmanship.

B. Maintenance: Submit for owner’s consideration and acceptance of a maintenance service agreement for installed products.

PART 2 - PRODUCT

2.1 MANUFACTURER

A. Manufacturer:
1. Cookson: 1901 South Litchfield, Goodyear, AZ 85338. Telephone: (800) 294-4358. Model ESD 30.
2. Cornell
3. Clopay Building Products
4. Overhead Door: Model 627.
5. Substitutions: Prior Approval Only

2.2 PRODUCT INFORMATON

A. Door Opening Size: 10’ wide x 12’ high; 12’ wide x 12’ high.
1. Interior mounting, face of wall.
2. Thermal break jamb & insulated assembly.

2.3 MATERIALS

A. Curtain: Air infiltration rate of less than .3 CFM/FT2, as tested per ASTM E283 validated by an independent testing agency. Test report required.
   1. Fabrication:
      a. Slat Material: No. 6F, (Listed Exterior/Interior):
         1) Galvanized Steel/Galvanized Steel: Manufacturer recommended gauge based on performance requirements. Minimum 24/24 gauge, Grade 40, ASTM A 653 galvanized steel zinc coating.
      b. Insulation: 7/8 inch (22 mm) foamed-in-place, closed cell urethane
      c. Total Slat Thickness: 15/16 inch (24 mm)
      d. Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84
      e. R-value: 8.0
      f. STC Rating: Sound Transmission Class (STC) rating up to 30 for the curtain and up to 22 for the entire assembly. If an STC of 32 is desired, additional options are required. All configurations are evaluated per ASTM E90 and based on testing a complete, operable assembly
   2. Exterior Slat Finish:
      a. SpectraShield® Coating System (Color Selected by Architect):
         1) ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding, gray baked-on base coat and gray baked-on polyester finish coat
         2) Zirconium treatment followed by baked-on polyester powder coat, with color as selected by Architect from manufacturer's standard color range; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better
   3. Interior Slat Finish:
      a. SpectraShield® Coating System (Color Selected by Architect):
         1) ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding, gray baked-on base coat and gray baked-on polyester finish coat
         2) Zirconium treatment followed by baked-on polyester powder coat, with color as selected by Architect from manufacturer's standard color range; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better

B. Endlocks: Fabricate interlocking sections with high strength nylon or galvanized cast iron endlocks on alternate slats each secured with two ¼” (6.35 mm) rivets. Provide windlocks as required to meet specified wind load.
   1. Nylon: Required up to 21’-5” width (DBG - Distance Between Guides)
   2. Galvanized cast iron: Required if above 21’-5” width (DBG - Distance Between Guides)

C. Bottom Bar
   1. Configuration:
      a. Insulated Bottom Bar: Reinforced extruded aluminum interior face with full depth insulation and exterior skin slat to match curtain material and gauge. Minimum 8” tall x 1-1/16” thickness.
   2. Finish:
      a. Exterior: Match slats
      b. Interior: Powder coat to match slats.
   3. Air Infiltration Certification Label: Must be affixed to bottom bar

D. Guides:
   1. Fabrication:
      a. Thermal break required. Minimum 3/16 inch (4.76 mm) structural steel angles. Provide windlock bars of same material when windlocks are required to meet specified wind load. Top of inner and outer guide angles to be flared outwards to

form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar.

Top 16 ½" (419.10 mm) of coil side guide angles to be removable for ease of curtain installation and as needed for future curtain service

2. Finish:
   a. SpectraShield® Coating System (Color Selected by Architect): Zirconium treatment followed by baked-on polyester powder coat, color as selected by Architect from manufacturer's standard color range; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better
   b. Corrosion Inhibitive: Zirconium treatment followed by a corrosion inhibitive baked-on zinc enriched gray polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness
   c. Hot-dip Galvanized: ASTM A 123, Grade 85 zinc coating, hot-dip galvanized after fabrication

E. Counterbalance Shaft Assembly:
1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width

F. Brackets:
Fabricate from minimum 3/16 inch (5 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures
1. Finish:
   a. SpectraShield® Coating System (Color Selected by Architect): Zirconium treatment followed by baked-on polyester powder coat, color as selected by Architect from manufacturer's standard color range, over 180 colors minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better
   b. Corrosion Inhibitive: Zirconium treatment followed by a corrosion inhibitive baked-on zinc-rich gray polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness
   c. Hot-dip Galvanized: ASTM A 123, Grade 85 zinc coating, hot-dip galvanized after fabrication

G. Hood:
Minimum 24-gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets as required to prevent excessive sag.
1. Finish:
   a. SpectraShield® Coating System (Color Selected by Architect):
      1) ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding, gray baked-on base coat and gray baked-on polyester finish coat
      2) Zirconium treatment followed by baked-on polyester powder coat, with color as selected by Architect from manufacturer's standard color range; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better

H. Weatherstripping:
1. Bottom Bar:
   a. Manually Operated Doors: Replaceable, bulb-style, compressible EDPM gasket extending into guides
2. Guides: Replaceable vinyl strip on guides sealing against both sides of curtain.
3. Lintel Seal: Double brush seal with EPDM sandwiched between the two brush seals at door header to impede air flow.
4. Hood: Neoprene/rayon baffle to impede air flow above coil.

2.4 OPERATION

A. Manual ControlGard Chain Hoist: Provide chain hoist operator with endless steel chain, chain pocket wheel and guard, geared reduction unit, and chain keeper secured to guide. Chain hoist to include integral brake mechanism that will immediately stop upward or downward travel and maintain the door in a stationary position when the hand chain is released by the user.

2.5 ACCESSORIES

A. Locking:
   1. Masterkeyable cylinder operable from coil side of bottom bar, options for all types of operation. Provide interlock switches on Motor operated units. See door hardware manufacturer for cylinder type. (See Section 08 71 00 “Door Hardware”.)

B. Operator and Bracket Mechanism Cover: Minimum 24 gauge galvanized steel sheet metal cover to enclose exposed moving operating components at coil area of unit. Finish to match door hood.

C. Trim Package: Minimum 16 gauge powder coated steel to match guides.

D. Vehicle exhaust gated portal in bottom bar:
   1. 4” diameter port.
   2. Gravity portal gate cover.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.

B. Do not begin installation until openings have been properly prepared.

C. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

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

E. Commencement of work by installer is acceptance of substrate

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

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

3.3 INSTALLATION

A. Install insulated rolling doors in accordance with approved shop drawings and the manufacturer’s printed instructions.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

C. Anchor assembly to wall construction and building framing without distortion or stress.

D. Fit and align door assembly including hardware.

3.4 CLEANING

A. Adjust door assembly to smooth operation and in full contact with weatherstripping.

B. Clean doors, frames and glass.

C. Remove temporary labels and visible markings.

3.5 PROTECTION

A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

B. Protect installed products until completion of the project.

C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

3.6 DEMONSTRATION

A. Demonstrate proper operation to Owner's Representative

B. Instruct Owner's Representative in maintenance procedures

END OF SECTION

DIVISION 8 – OPENINGS
SECTION 08 34 00 – SLIDING DOOR SYSTEM

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. CommercialSlide Interior Aluminum-Framed Top-Hung Sliding Door System

B. Related Sections:
1. Section 08 14 16 "Flush Wood Doors".

1.3 REFERENCES

A. ANSI – American National Standards Institute

B. ANSI 156.18 Materials and Finishes

C. ANSI A117.1 Specifications for making buildings and facilities usable by physically handicapped people.

D. BHMA – Builders Hardware Manufacturers Association

E. DHI – Door and Hardware Institute

F. NFPA – National Fire Protection Association

G. NFPA 80 – Fire Doors and Windows

H. NFPA 101 – Life Safety code

I. NFPA 105 – Smoke and Draft Control Door Assemblies

J. NFPA 252 – Fire Tests of Doors Assemblies

K. AWS – Architectural Woodwork Standards

1.4 SUBMITTALS

A. Comply with Section 01 33 00 "Submittals".

B. Product Data: Submit manufacturer's product data, including installation instructions.

C. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, components, hardware, finish, options, and accessories. Shop Drawings to show required blocking by others.

D. Samples: Submit manufacturer's samples of the Aluminum Frame as needed

E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for the intended application.

F. Warranty Documentation: Submit manufacturer's standard warranty for complete system

G. Test Reports: Submit acoustical reports or UL1784 as applicable.

H. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings indicate the size, profiles, and dimensional requirements of interior aluminum frames and doors.

B. Source: Obtain sliding aluminum framed doors and hardware.

C. Manufacturer's Qualifications: Manufacturer engaged in Doors, Aluminum Extrusions, Hardware and Construction for a minimum of 10 years combined similar to that specified.

1.6 PERFORMANCE

A. Aluminum perimeter frames with integrated gaskets and seals at all door/frame interfaces

B. Independent Removable Soft Closer integrated into the top of the track. Removable without removing the door.

C. Concealed 1 ¼" Ball Bearing Roller Guides with intergraded Trigger Arm

D. Concealed Ball Bearing Floor Guide

E. Concealed Active Safety Feature located at both ends of the track

F. Manufacturer to submit test data on air infiltration and/or smoke ratings as applicable

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Notify the manufacturer immediately of any shipping damage.

C. Storage and Handling Requirements:
1. Store and handle materials in accordance with the manufacturer's instructions.
2. All manufacturer's product remains in its unopened packaging until installation.
3. Store materials in a clean, dry area indoor area with a temperature above 60 degrees
4. Protect materials and finish during storage, handling, and installation to prevent damage.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. MODTRAXTM, 390-12 Knickerbocker Avenue, Bohemia, NY 11716, Phone: 631-248-3500, Website: modtrax.com Information, questions, and estimates info@modtrax.com

2.2 INTERIOR SLIDING ALUMINUM-FRAMED SYSTEM WITH WOOD DOOR

A. Scheduled Manufacturer:
1. Manufacturer: MODTRAXTM: CommercialSlide™ High-Performance Sliding Door System

B. Acceptable Substitution MUST have the following:
1. Removable Soft Closer without removing or readjusting the door
2. Ball Bearing Rollers and Guides
3. Active Safety Features at both ends of the track

4. Pre-Assembled Track
5. Hardware: Anti-Vibration Nuts and Bolts at the Soft Closers and HD Hanger Bracket
6. Approval by architect.
7. See Section 01 60 00 Product Requirements for BABAA compliant substitution requests.

C. Specified Wall Thickness: 3 ½”

D. Frame Profiles: Extruded one-piece aluminum frame with integrated vertical door pocket jamb. Frames to have integrated seal surrounding door leaf. Gasketing is required at all frame-to-door interfacings.

E. All gaskets to meet All Silicone Gaskets are Air Infiltration Tested, Sound Tested – ATSM-E90 BHMA Certified, Smoke Tested – UL1784, Fire Rated – UL10C, Positive Pressure Tested, Underwriters Laboratory 410 & Green Gold Certified. Integrated Pile Gaskets are Added for improved Acoustic Performance

F. Finish:
1. Standard: Clear Anodized Silver (Matching Kynar Light Sequin 789G048)

G. Door Leaf: All Doors to be factory machined for hardware, floor guide channel & auto dropdown if specified, the edge of the door to be fully finished.

H. STC Options/Notes: ModTrax STC Rated System is rated up to STC 39. When specifying the Door, you can choose an STC Rated Door from STC 35 to STC 39. Please keep in mind the higher the STC Rating the more expensive the Door becomes.
1. 1-3/4" Flush Wood Door: Reference Spec Section 08 14 16 “Flush Wood Doors” or other sections as applicable.
   a. Standard stile widths are 6” with a 10” bottom rail.
2. Other 1 3/4”: Door manufacture specified by an architect

I. Door Components:
1. Single Top Track: Pre-Assembled Clear Anodized Silver finish aluminum track
2. Valances: Aluminum Valance with end caps screwed to top track for safety requirements
3. Roller Guides: (2) Independent Ball Bearing Roller Guides with integrated trigger arms
4. Floor Guide: Ball Bearing Floor Guide with aluminum track integrated bottom of the door
5. Active Safety Feature: Active Safety Installed by the factory at both ends of the track
6. Soft-Closer: Independent Soft Closers at both ends of the track Integrated into the head of the track. Must be removable without removing or readjusting the door.
7. Door Stops: 2 ¼” Door Stops at each end of the track W/ rubber bumpers and set screws
8. Hanger Bracket: Two 1 ¾” Heavy Duty Hanger Brackets with 6 points of attachments
9. Hardware: Anti-Vibration Nuts and Bolts at the Soft Closers and HD Hanger Bracket
10. Handles:
    a. Valance
       1) Standard square valance.
       2) Sloped valance.
    b. Ladder
       1) Standard Ladder or Straight Pull: 12” long x 1” diameter. Finish: US32D

J. Locks:
1. Not Required
2. Magnetic Lock

K. STC Options/Notes: ModTrax STC Rated System is rated up to STC 39. When specifying the Door, you can choose an STC Rated Door from STC35 to STC39. Please keep in mind the higher the STC Rating the more expensive the Door becomes. For standard acoustics use (ADBG-1) Auto Door Bottom Gasket. For an STC Rated System Use (ADHG-1) & (ADBG-1) Auto Door Bottom & Head Gaskets for Sliding Doors for improved acoustical performance.

1. Manufacturer: MODTRAXTM, 390-12 Knickerbocker Avenue, Bohemia, NY 11716, Phone: 631-248-3500, Website: modtrax.com questions, and estimates info@modtrax.com
2. Proprietary Products/Systems: Auto Gasket for Sliding Doors include the following:
   a. Custom Auto Door Bottom Gasket Model: ADBG-1 Zero Closing Force, Handed & Mortise
      1) Material: Extruded aluminum
      2) Finish: Mill Finish Aluminum
      3) Seal: high-Grade Silicone
      4) End Plates: Provide end plates for mortise
      5) Manufacturer Model Number: ADA-GC1
      6) Includes: (6) Screws, (1) Masonry drill bit, (1) extended Phillips's tip, and (3) lead shields
      7) (3) Adjustable floor guides for height from 1/4"- 5/8"
      8) Trailing Edge Triple fin gasket
      9) Custom Bulb Gasket concealed at perimeter of jambs against drywall.
   b. Custom Auto Door Head Gasket: Model: ADHG-1 Zero Closing Force, Handed & Mortise
      1) Material: Extruded aluminum
      2) Finish: Clear Anodized & Mill Finish Aluminum
      3) Seal: high-Grade Silicone
      4) Manufacturer Model Number: ADHG-1
      5) Includes: (4) Self Drilling Screws
      6) (1) Adjustable guides for height from 1/4"- 5/8"
      7) (1) Adjustable guide bracket
      8) Trailing Edge triple Fin Gasket
      9) Custom Bulb Gasket concealed at perimeter of jambs against drywall

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine openings of sliding doors, must be plumb, level, and square.

B. Confirm Rough Opening to be exact as per manufactures requirements for all openings

C. Installation should not install unless the above items are correct

D. Notify Architect if site conditions do not meet the specification or the manufactures

E. Blocking: All Blocking MUST be installed and flush with framing prior to drywall installation as per manufactures requirements

F. Finish door operation will be affected if the Framing, Blocking is not as per manufactures requirements or is not Plumb, Level, and Square

3.2 INSTALLATION

A. Installation of sliding doors as per manufacturer's instructions.

B. Install sliding doors plumb, level, square, and in proper alignment.

C. Install sliding doors to close against walls without gaps

D. Install sliding doors to open and close smoothly.

E. Anchor sliding doors track system into 2 x 4 blocking required full length of the track.

3.3 ADJUSTING

A. Adjust sliding doors for proper operation in accordance with the manufacturer's instructions.

B. Adjust sliding doors to operate smoothly without binding.

3.4 CLEANING

A. Clean sliding doors promptly after installation in accordance with the manufacturer's instructions.

B. Do not use harsh cleaning materials or methods that could damage materials or finish.

3.5 PROTECTION

A. Protect installed sliding doors from damage during construction

END OF SECTION

DIVISION 8 – OPENINGS
SECTION 08 41 13 – ALUMINUM FRAMED STOREFRONT & ENTRANCE

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: Kawneer Architectural Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.
   1. Types of Kawneer Aluminum Storefront Systems includes:
      a. EnCORE Framing System (Exterior, 1-3/4" Sightline, front glass)
      b. Trifab™ 451UT Framing (Interior) – 2" x 4-1/2" (50.8 mm x 114.3 mm) nominal dimension; Thermal; Center Plane, Screw Spline Fabrication.
   2. Types of Kawneer Aluminum Storefront Entrance includes:
      a. 350 Swing Door; Medium stile, 3-1/2" (89 mm) vertical face dimension, 1-3/4" (44.5 mm) depth, high traffic applications.

B. Related Sections:
   1. 07 92 00 "Joint Sealants & Gasketing"
   2. 08 81 00 "Glazing"

1.3 DEFINITIONS

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) –AAMA Glossary (AAMA AG).

1.4 PERFORMANCE REQUIREMENTS

A. Storefront System Performance Requirements:
   1. Wind loads: Provide storefront system; that meets the requirements of **current** IBC for Augusta, Georgia
   2. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft2(0.3 l/s · m2) at a static air pressure differential of 6.24 psf (300 Pa).
   3. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 8 psf (383 Pa) as defined in AAMA 501.
   4. Uniform Load: A static air design load of 20 psf (958 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, hardware, finishes, and installation instructions for each type of aluminum-framed storefront system indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, and attachments to other work, operational clearances and installation details.

C. Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection.

D. Samples for Verification: For aluminum-framed storefront system and components required.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type of aluminum-framed storefront.

F. Warranty: Special warranty specified in this Section.

G. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12" (304.8 mm) lengths of full-size components and showing details of the following:
1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

H. 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. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

I. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of providing aluminum-framed storefront system that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.

C. Source Limitations: Obtain aluminum-framed storefront system through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum-framed storefront system and are based on the specific system indicated. Do not modify size and dimensional requirements.
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

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. Build mockup for type(s) of storefront elevation(s) indicated, in location(s) shown on Drawings.

F. Pre-installation Conference: Contractor to schedule meeting at least one (1) week prior to installation & conduct conference at Project site.

G. Structural-Sealant Glazing: Comply with ASTM C 1401, “Guide for Structural Sealant Glazing” for design and installation of structural-sealant-glazed systems.

H. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of aluminum-framed storefront openings by field measurements before fabrication and indicate field measurements on Shop Drawings.

1.8 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty.
   1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

PART 2 -PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product:
   1. Kawneer Company Inc.
      a. EnCORE Framing System (Exterior)
      b. Trifab 451UT Framing System (Interior)

B. Substitutions: Refer to Substitutions Section for procedures and submission requirements
   1. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (10) days prior to bid date.
   2. Post-Contract (Construction Period) Substitutions: Submit written request in order to avoid storefront installation and construction delays.
   3. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
   4. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for storefront system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum storefronts for a period of not less than ten (10) years. (Company Name)
   5. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.
   6. Samples: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.

C. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.090"(2.3 mm) wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.

B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum framing members, trim hardware, anchors, and other components.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

E. Sealant: For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

F. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

2.3 STOREFRONT FRAMING SYSTEM

A. Non-Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.

C. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

D. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

E. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Section 08 81 00 “Glazing”.

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:

1. Structural Sealant: ASTM C 1184, single-component neutral-curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural-sealant manufacturer for use in aluminum-framed systems indicated.
   a. Color: Black
2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class25, UsesNT, G, A, and O; single-component neutral -curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
   a. Color: Matching structural sealant.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Door Hardware: As specified in Section 08 71 00 “Door Hardware”.

2.6 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 07 92 00 “Joint Sealants & Gasketing”.

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint12 requirements except containing no asbestos; formulated for 30 mil (0.762 mm) thickness per coat.

C. Other required items for complete assembly (sill flashing, end dams, etc.)

2.7 FABRICATION

A. 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 fit joints; make joints flush, hairline and weatherproof.
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.
6. Provisions for field replacement of glazing.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

B. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

C. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

D. Storefront Framing: Fabricate components for assembly using manufacturer’s standard installation instructions.

E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Factory Finishing:
1. AA-M10C21A44 / AA-M45C22A44, AAMA 611, Architectural Class I Color Anodic Coating Color Anodized.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight aluminum-framed storefront system installation.
1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.

3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum-framed storefront system, accessories, and other components.

B. Install aluminum-framed storefront system level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.

D. Install aluminum framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating within aluminum-framed storefront system to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

A. Field Tests: Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.
   1. Testing: Testing shall be performed by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements. Testing Standard per AAMA 503, including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 Water Infiltration Test.
      a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft 2, whichever is greater.
      b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.24 psf (300 Pa).

B. Manufacturer's Field Services: Upon Owner’s written request, provide periodic site visit by manufacturer’s field service representative.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Clean aluminum surfaces immediately after installing aluminum-framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION

DIVISION 8 - OPENINGS
SECTION 08 52 13 – CLAD WOOD WINDOWS

PART 1 – GENERAL

1.1 SUMMARY

A. Related Documents: Provisions within the General and Supplementary Conditions of the contract, Division 1 General Requirements and Drawings.

B. Aluminum clad exterior/wood interior Direct Set windows.

1.2 RELATED SECTIONS

A. Section 01 33 00 “Submittals”.

B. Section 06 20 00 “Finish Carpentry”.

C. Section 07 92 00 “Joint Sealants & Gasketing”

1.3 REFERENCES

A. American Architectural Manufacturers Association (AAMA):
1. AAMA/WDMA/CSA 101/I.S.2/A440– North American Fenestration Standard/Specification (NAFS) for windows, doors and skylights.
2. AAMA 502 – Voluntary Specification for Field Testing of newly installed windows and doors.
3. AAMA 2605 or 2604 – Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

B. American National Standards Institute (ANSI):
1. ANSI Z97.1 – Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.

C. American Society for Testing and Materials (ASTM):
1. ASTM C1036 – Standard Specification for Flat Glass.
2. ASTM C1048 – Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.
3. ASTM D3359 Standard Test Methods for Measuring Adhesion by Tape Test.
4. ASTM D5235 - Standard Test Method for Microscopical Measurement of Dry Film Thickness of Coatings on Wood Products.
5. ASTM E1105 – Standard Test Method for Field Determination of Water Penetration of Installed Windows, Doors, Curtain Walls and Skylights by Uniform or Cyclic Static Air Pressure Difference.
6. ASTM E1424 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure and Temperature Differences Across the Specimen.
7. ASTM E283 – Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
8. ASTM E330 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
9. ASTM E547 – Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Difference.

D. Consumer Products Safety Commission:
1. 16 CFR, Part 1201 – Safety Standard for Architectural Glazing Material.

E. National Fenestration Rating Council (NFRC):
1. NFRC 100 – Procedure for Determining Fenestration Product U-Factors.

2. NFRC 200 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient (SHGC) and Visible Transmittance (VT) at Normal Incidence.
3. NFRC 501 – Procedure for Determining Fenestration Product Condensation Resistance Values.

F. Windows and Door Manufacturers Association (WDMA):
1. AAMA/WDMA/CSA 101./I.S.2/A440 NAFS for windows, doors and skylights.
2. WDMA I.S.4 – Industry Standard for Water Repellent Preservative Non-Pressure Treatment for Millwork.

1.4 SUBMITTALS

A. Provide submittals under provisions of Division 1.

B. Provide Data: Include the following for each type of window required:
1. Construction details and fabrication methods.
2. Profiles and dimensions of individual components.
3. Data on accessories and finishes.
4. Recommendations for maintenance and cleaning of exposed surfaces.

C. Shop Drawings: Include information not fully detailed in manufacturer's product data and include the following for each type of window required:
1. Layout and installation details, including anchors.
2. Elevations.
3. Full size section details of typical composite members, including reinforcement and stiffeners.
4. Glazing details.
5. Accessories.

D. Samples: Submit one corner section. Where finishes involve normal color variations, include sample sets showing full range of expected variations. Submit color samples as appropriate.

E. Warranty:
1. Provide manufacturer’s standard warranty as follows:
   a. Workmanship and Materials: 10-year limited warranty.
   b. Insulating Glass: 20-year limited warranty (Residential and Commercial).
   c. Exterior aluminum clad finish:
      1) Commercial AAMA 2605 Powder Coat Finish: 20-year limited warranty on aluminum clad coating against cracking, color change, chalking, or peeling (adhesion loss) in normal conditions; 10-year limited warranty on aluminum clad coating against cracking, color change, chalking, or peeling (adhesion loss) in extreme conditions.
      2) AAMA 2604 Powder Coat Finish Clad: 10-year limited warranty on aluminum clad coating against cracking or checking.
2. Interior Finish: 2-year limited warranty.
3. Labor: 2-year limited warranty.

F. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.5 QUALITY ASSURANCE

A. Mockup:
1. Provide sample for review and installation in a test wall.
2. Approved mockup shall reflect minimum quality required for the work.
3. Approved mockup shall remain in place within the work.

B. Manufacturers Qualifications: Manufacturer shall have produced type of windows specific for a minimum of ten years, with similar projects that have been in successful use for a minimum of ten years.

C. Obtain windows through one source from a single manufacturer.

D. Safety Glass Standard: Provide products complying with testing requirements of United States Consumer Product Safety Commission's 16 CFR, Part 1201 for Category II materials or as prescribed by local codes. Provide products complying with ANSI Z97.1.
1. Subject to compliance with project requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

E. Insulated Glass Certification: Provide insulated glass units permanently marked on spacers or on at least one component pane of units with appropriate certification label of inspecting agency.

F. WDMA Hallmark Certification: Provide products that have been certified as having been manufactured in accordance with WDMA Hallmark standards. Compliance is verified through independent third-party product testing and semi-annual inspections of the manufacturing facility.

G. Wood Components Sustainability Standards: Provide products that have been certified by independent third parties and labeled as having been produced in compliance with the accepted principles of sustainable forest management. Current certification systems that meet this standard of sustainability include the Sustainable Forestry Initiative (SFI), the ISO 14001 EMS program, the Forest Stewardship Council (FSC), and the CSA certification system.

1.6 DELIVERY, STORAGE AND HANDLING

A. Ship units with both temporary and permanent NFRC labeling.
1. Temporary label shall indicate that the unit is NFRC certified and include a brief product description and thermal or energy performance values.
2. Permanent label shall include manufacturer identification and performance tracking for life of product.

B. Deliver in original packaging, undamaged, with clear labels and installation instructions.

C. Storage:
1. Protect the materials. Store off ground, in an upright position, and protect from sun and weather.

D. Handling:
1. Protect materials and finish during handling and installation to prevent damage.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: Sierra Pacific Windows.

B. Substitutions: See Section 01 60 00 "Product Requirements".

2.2 PRODUCT CALLOUTS

A. C-SPDS – Clad Direct Set.

2.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: CW-P650.

B. In accordance with ASTM E1424, ASTM E283, ASTM E330 and ASTM E547.

2.4 THERMAL PERFORMANCE RATING

A. Glazing Type and Finish: Low E 366-Warm Edges Spacer.

1. U-Factor, NFRC 100: .30
2. Solar Heat Gain Co-Efficient (SHGC), NFRC 200: .24
3. Visible Light Transmission (VLT), NFRC 200: .56
4. Condensation Resistance, NFRC 501: 55

2.5 SOUND TRANSMISSION CLASS (STC) AND OUTDOOR-INDOOR TRANSMISSION CLASS (OITC)

A. STC Rating: 33.

B. OITC Rating: 28.

2.6 MATERIALS

A. Wood:
1. Species: Pine kiln-dried to moisture content of 6 to 12 percent at time of fabrication; water-repellent preservative treated in accordance with WDMA I.S.4.
   a. Sustainable Forestry Initiative® (SFI) certified wood components.
   b. Interior exposed wood: Natural unfinished, suitable for staining or painting.
   c. Wood treatment: CoreGuard Plus™ is applied to any wood component (all species) that is in direct contact to the exterior elements, extruded aluminum clad material and glass. CoreGuard Plus™ is an organic water-based solution containing fungicides and insecticides, with nearly zero VOC's, in accordance with WDMA I.S.4. to protect from pests and rotting.

B. Aluminum cladding: .065" thick extruded aluminum.

2.7 FRAME DESCRIPTION

A. Frame thickness: 1-1/16".

B. Basic Jamb Depth: 4-9/16".

C. Clad exterior frame corners are mitered and mechanically fastened, fully injected silicone for a watertight seal.

D. Standard interior wood frame components are select pine, solid or finger-jointed and veneer wrapped.

E. Integral extruded aluminum nailing fin.

F. Extruded aluminum drip cap factory applied to frame.

2.8 GLAZING: PROVIDE MANUFACTURER'S STANDARD GLAZING MATERIAL COMPLYING WITH ASTM C1036 AND ASTM C1048

A. Insulated glass with No-Metal TrueWarm® edge polymer structural foam spacer and acrylic barrier.

B. Factory-glazed fabrication: Comply with requirements of AAMA/WDMA 101/I.S.2/NAFS requirements.

C. Interior or exterior glazed with exterior sealant and tape dam with removable glazing bead.

D. Glass Type:
1. Dual Pane.
2. Laminated and tempered glass with safety glazing requirements in accordance with 16 CFR 1201 for Category II materials.

E. Bead Stop: Traditional.

2.9 FINISHES

A. Interior Finish: Pine in compliance with ASTM D3359 and ASTM D5235
   1. Ultra Stain; finish to be selected by Architect.

B. Exterior clad finish: Manufacturer's pre-treated aluminum surface with baked-on, electrostatically applied powder coat with virtually no VOC's, conforming to specified AAMA 2604 and AAMA 2605 test procedures. Color specified from one of four available design collections.
   1. Manufacturer's 100% fluoropolymer resin, 1.5 to 2.5 mil dry film thickness. Factory finish to comply with AAMA 2605.
   2. Color: Urbane Bronze.

2.10 JAMB EXTENSION

A. Jamb depth: 11"
   1. Basic Jamb width is 4-9/16" standard. Additional jamb depths required are 6-7/16", custom specified.

B. Factory shipped loose extension jambs that match frame and sash interior finish.

2.11 GRILLES

A. SDL style and size: Traditional Clad; 7/8" horizontal and 2" vertical.
   1. Fabricate exterior SDL bars of extruded aluminum.
   2. Fabricate insulated glass with internal shadow bar to create appearance of true divided lites.
   3. Lite pattern: Custom – See Drawings.

2.12 TRIM

A. Clad Exterior Trim: 2 2" traditional sill nose.

B. Clad Sill Nose Profile: Standard.

C. Exterior Trim: Factory-Applied

D. Interior Trim: Shipped Loose

PART 3 – EXECUTION

3.1 EXAMINATION

A. Site verification of conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.

B. Verify that field measurements are acceptable to suit window unit tolerances.

C. Verify sill plate is level.

D. Verify supports and anchors are correctly and securely positioned.

E. Verify masonry surfaces are dry and free of construction debris.

F. Verify wood frame walls are dry, clean, sound, well-nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3" of corner.

G. Scheduling of installation implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer's acceptance of substrate and conditions.

3.2 INSTALLATION

A. Coordinate window installation with wall flashings and other built-in components.

B. Install window units, hardware, and components in accordance with manufacturer's instructions and approved shop drawings, in compliance with specified performance requirements, and to provide weathertight construction.

C. Anchor components securely to building structure, plumb and level, accurately fitted, and free from distortion or defects.

D. Fit exposed connects to form tight hairline joints.

3.3 FIELD QUALITY CONTROL

A. Field Testing: Per industry standard recommendations that the Manufacturer have a representative present for all testing, SPW requires a company representative be present for all field testing performed. Therefore, we request a minimum of 14 calendar days' notice prior to any scheduled field testing to allow time to make travel arrangements. The SPW representative will confirm that proper field test protocol is followed, will be there for general observation, will assist with product-specific applications and will represent SPW as the Manufacturer during the testing.
   1. We agree to field testing in accordance with:
      a. AAMA 502-21: Voluntary Specification for Field Testing of Newly installed Fenestration Products.
      b. ASTM E1105: Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference.
   2. We agree to field water testing at a pressure not to exceed 2/3 of the required project design pressure or 2/3 of the laboratory tested design pressure, whichever is less. The 2/3 test pressure is derived from Section 7.5.3 of AAMA 502-21. Per AAMA 502, a 1/3 reduction in field test pressure is specified as a reasonable adjustment for the differences between a laboratory test environment and a field test environment.
   3. Additionally, we agree to the pass/fail criteria per AAMA 502 and ASTM E1105 documents which define water penetration attributable to the fenestration product as water which passes the innermost plane of the fenestration product.

3.4 CLEANING

A. Clean interior and exterior surfaces immediately after installation in accordance with manufacturer's recommendations for cleaning and maintenance.

B. Remove temporary labels from surfaces.

C. Remove and replace glass damaged during construction period.

3.5 PROTECTING INSTALLED CONSTRUCTION

A. Protect window units from damage or deterioration until substantial completion.

END OF SECTION

DIVISION 8 - OPENINGS
SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. **Note: All hardware to be submitted to and verified (signed-off) by Department Of Veteran Service before being ordered or installed.**

B. This Section includes items known commercially as finish or door hardware that are required for swing, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

C. This Section includes the following:
1. Hinges.
2. Lock cylinders and keys.
3. Lock and latch sets.
4. Closers.
5. Overhead Holders.
6. Protection Plates.
7. Weatherstripping for exterior doors.
8. Thresholds.

D. Related Sections: The following Sections contain requirements that relate to this Section:
1. Section 08 11 13 “Hollow Metal Doors and Frames” for silencers integral w/hollow metal frames.
2. Section 08 14 16 “Flush Wood Doors” for factory pre-fitting and factory pre-machining of doors for door hardware.

E. Products furnished but not installed under this Section include:
1. Final replacement cores and keys to be installed by Hardware supplier’s locksmith.

1.2 SUBMITTALS

A. General: Submit the following in accordance with Section 01 33 00 “Submittals”.

B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
   a. Type, style, function, size, and finish of each hardware item.
   b. Name and manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
   e. Explanation of all abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for hardware.
   g. Door and frame sizes, materials, and fire rating.
   h. Keying information.
2. Submittal Sequence: Submit initial draft of final schedule along with essential product data in order to facilitate the fabrication of other work that is critical in the Project construction schedule. Submit final schedule after samples, product data, coordination with shop drawings of other work, delivery schedules, and similar information has been completed and accepted.
3. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's

final instructions on keying of locks has been fulfilled.

D. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.3 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of hardware (latch and locksets, hinges, closers, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
1. Require supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing.
2. Hardware supplier on this project must make an on-site inspection to be certain new hardware has been properly adjusted and installed.
3. Supplies must be authorized by hardware manufacturer.

C. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

1.4 PRODUCT HANDLING

A. Tag each item or package separately with identification related to final hardware schedule and include basic installation instructions with each item or package.

B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container. All hardware shall have the screws, bolts, and fastenings for its installation, packed in the same package with the hardware. All packages shall be legible and adequately labeled indicating the location for which they are needed.

C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.5 MAINTENANCE

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. Provide 4-hours of training for maintenance and adjustment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Any substitution for products must be approved in writing by the Architects ten (10) days prior to bid opening. Subject to compliance with requirements, provide products by one of the

following: See Hardware Schedule.

B. Approved manufacturers of locksets hardware:
1. Sargent.

2.2 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. Products are identified by using hardware designation numbers of the following:
1. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is specified under the Article "Manufacturers" in Part 2 for each hardware type, comparable product of one of the other manufacturers that complies with requirements.
2. ANSI/BHMA designations used elsewhere in this Section or schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying w/these standards & requirements specified elsewhere in this Section.
a. Butts and Hinges: ANSI/BHMA A156.1.
b. Bored and Preassembled Locks and Latches: ANSI/BHMA A156.2.
c. Exit Devices: ANSI/BHMA A156.3.
d. Door Controls - Closers: ANSI/BHMA A156.4.
e. Auxiliary Locks and Associated Products: ANSI/BHMA A156.5.
f. Architectural Door Trim: ANSI/BHMA A156.6.
g. Template Hinge Dimensions: ANSI/BHMA A156.7.
h. Door Controls - Overhead Holders: ANSI/BHMA A156.8.
i. Mortise Locks and Latches: ANSI/BHMA A156.13.
j. Auxiliary Hardware: ANSI/BHMA A156.16.
k. Materials and Finishes: ANSI/BHMA A156.18.

2.3 MATERIALS AND FABRICATION

A. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.
1. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

D. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.

E. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners.

F. Use thru-bolts for installation of door closers on wood. Provide sleeves for each thru-bolt or use sex screw fasteners.

2.4 HINGES & BUTTS

A. Templates: Provide only template-produced units.

B. Screws: Provide Phillips flat-head screws complying with the following requirements:
1. For metal doors and frames install machine screws into drilled and tapped holes.
2. For wood doors, install wood screws #12 x 1-1/4-inch.
3. For fire-rated mineral core wood doors install half-surface hinges with through bolts.
4. Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
1. Out-Swing Exterior Doors: Non-removable pins.
2. Interior Doors: Non-rising pins.
3. Tips: Flat button and matching plug, finished to match leaves.

D. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors 90 inches or less in height and one additional hinge for each 30 inches of additional height.
1. Fire-Rated Doors: Not less than 3 hinges per door leaf for doors 86 inches or less in height with same rule for additional hinges.
2. For fire-rated mineral core wood doors install half-surface hinges with through bolts.

2.5 LOCK CYLINDERS AND KEYING

A. Establish new keying system.

B. Review the keying system with the Owner and provide the type required (master, grandmaster and great-grandmaster).

C. Equip locks with cylinders for interchangeable-core Maximum Security Keying System tumbler inserts, Grade 1 cylinders as listed in ANSI/BHMA A156.5 and that have been tested for pick and drill resistance requirements of UL 437 and are UL listed.
1. Furnish only temporary inserts for the construction period.
2. Manufacturer shall furnish final cores and keys to project site for installation by contractor’s locksmith.
3. The Contractor shall have the hardware supplier visit the site when the permanent lock cores are installed to remedy any installation problems that may arise.
4. The Contractor shall have the hardware supplier visit the job site when the installation of hardware is complete to inspect for installation and operation in accordance with the manufacturer’s recommendations.

D. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.

E. Comply with Owner's instructions for master keying.
1. Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE."

F. Key Material: Provide keys of nickel silver only.

G. Key Distribution:
1. Deliver keys to Owner with key control system.

2.6 LOCKS, LATCHES, AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.
1. Provide flat lip strikes for locks with 3-piece, antifriction latch bolts as recommended by manufacturer.
2. Provide recess type top strikes for bolts locking into head frames, unless otherwise indicated.
3. Provide dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.

B. Lock Throw: Provide 5/8-inch minimum throw of latch on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.
   1. Provide 1/2" minimum throw of latch for other bored & preassembled types of locks & 3/4" minimum throw of latch for mortise locks. Provide 1" minimum throw for all dead bolts.

C. Flush Bolt Heads: Minimum of 1/2"-diameter rods of brass, bronze, or stainless steel with minimum 12"-long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.

D. Exit Device Dogging: Except on fire-rated doors where closers are provided on doors equipped with exit devices, equip the units with keyed dogging device to keep the latch bolt retracted, when engaged.

2.7 PUSH/PULL UNITS

A. Exposed Fasteners: Provide manufacturer's standard exposed fasteners for installation.

2.8 CLOSERS AND DOOR CONTROL DEVICES

A. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit depending on size of door, exposure to weather, and anticipated frequency of use.
   1. Provide parallel arms for all overhead closers, except as otherwise indicated.

B. Access-Free Closers: Where closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 and ADAAG provisions for door opening force and delayed action closing.
   1. Closers shall be adjusted so that from a 90° open position, the time to move to 12° from the latch is five (5) seconds minimum.
   2. Spring hinges shall be adjusted so that from a 70° open position, the time to move to a closed position is 1.5 seconds minimum.
   3. The force for pushing or pulling open an interior door or gate, other than a fire door, whether hinged, sliding or folding, is five (5) pounds maximum.
   4. Fire doors to have the following maximum forces:
      a. Latch release – fifteen (15) pounds.
      b. Setting the door in motion – thirty (30) pounds.
      c. Opening the door – fifteen (15) pounds.
   5. Exterior doors may have an opening force greater than five (5) pounds, provided that sufficient quantities of ADA compliant door-opening assistance is provided.
   6. Installer to test & adjust all door hardware to comply with above provisions. Written “certification” for hardware adjustments on all doors to be included in O & M manual. Document installer’s qualifications, name, company, date and methods used for testing.

C. Provide grey resilient parts for exposed bumpers.

2.9 DOOR TRIM UNITS

A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.

B. Fabricate edge trim of stainless steel to fit door thickness in standard lengths or to match height of protection plates.

C. Fabricate protection plates not more than 1-1/2 inches less than door width on hinge side and not more than 1/2 inch less than door width on pull side by height indicated.
   1. Metal Plates: Stainless Steel, 0.062 inch (U.S. 16 gage).
   2. Protective plates exceeding 16” above the bottom of a fire-rated door are to be properly labeled in accordance with NFPA 80 - 2019.

2.10 WEATHERSTRIPPING AND SEALS

A. General: Provide continuous weather-stripping on exterior doors and smoke as scheduled. Provide non-corrosive fasteners for exterior applications and elsewhere as indicated.

B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

C. Weatherstripping at Jambs and Heads: Provide bumper-type resilient insert and metal retainer strips, surface applied unless shown as mortised or semi-mortised, and of following metal, finish, and resilient bumper material:
1. Extruded clear anodized aluminum, 0.050" minimum thickness of main walls and flanges.
2. Sponge neoprene conforming to MIL R 6130, Class II (Closed Cell).
   a. Grade A (30 deg F to 150 deg F, oil-resistant and self-extinguishing).
3. Solid neoprene conforming to MIL R 6855, Class II, Grade 40.
   a. Flexible, hollow bulb or loop insert.
4. Flexible vinyl hollow bulb or loop insert.
5. Brush pile insert of polypropylene or nylon woven pile and aluminum strip backing complying with AAMA 701.2.

D. Weatherstripping at Door Bottoms: Provide threshold consisting of contact-type resilient insert and metal housing of design and size shown and of following metal, finish, and resilient seal strip:
1. Extruded clear anodized aluminum finished 0.050-inch minimum thickness of main walls and flanges.
2. Solid neoprene wiper or sweep seal complying with MIL R 6855, Class II, and Grade 40.
3. Brush pile insert of polypropylene or nylon woven pile and aluminum strip backing complying with AAMA 701.2.
4. Provide rain drip on door bottom and head of frame for weather exposed doors.

2.11 THRESHOLDS

A. General: Except as otherwise indicated, provide standard metal threshold unit of type, size, and ADA Handicap profile scheduled. Screw thresholds to substrate with No. 10 or larger screws of the proper type for permanent anchorage and/or bronze or stainless steel which will not corrode in contact with the threshold metal. Cut and fit thresholds to profile of door frames, with mitered corners and hairline joints. Cut smooth openings for spindles, bolts, and similar items.

B. Exterior Hinged Doors: Provide units not less than 4"-wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware & fit door frames, as scheduled.

2.12 HARDWARE FINISHES

A. Match items to the standard color and texture finish for the latch and locksets:
1. Locksets & Latchsets: US 26D.
2. All other items: US 32D.

B. Provide finishes that match those established by BHMA and adopted by the Owner.

C. 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.

D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer." The prefix "SG" is used as the standard finish designations for all mortise lever locksets.

E. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

F. The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted.

1. Rust-Resistant Finish: For iron and steel base metal required for exterior work and in areas shown as "High Humidity" areas (and also when designed with the suffix -RR), provide 0.2-mil-thick copper coating on base metal before applying brass, bronze, nickel, or chromium plated finishes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations, and ADA Handicap provisions.
1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
2. "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute.
3. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Section 07 92 00 – “Joint Sealants and Gasketing”.

F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy & make final check, adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

B. Clean adjacent surfaces soiled by hardware installation.

C. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

3.3 HARDWARE SCHEDULE

A. General: Provide hardware for each door to comply with requirements of Section "Door Hardware," hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.
1. Hardware sets indicate quantity, item, manufacturer and product designation, size, and finish or color, as applicable.
3. All locks to be Great Grand Masterkeyed SARGENT system now currently in use.
4. Locks must be furnished w/4 change keys each & all locks must have wrought strike boxes.
5. **All hardware to be submitted to and verified (signed-off) by Department of Veteran**

Service before being ordered or installed.

B. List of Manufacturers:
1. Sargent & Company (SG) Locksets, Latchsets, Privacy, Cylinders.
2. Sargent & Company (SG) 351 – Closers
3. Dormakaba (formerly Stanley-McKinney) (DM) – Ball Bearing Hinges
4. Rockwood (RW) - Kick plates, Flush Bolts, Door Stops, Coat Hooks and Silencers
5. Pemko (PK) – Door Gasketing, Door Bottoms

C. Hardware Schedule:

Hardware Set No. [1]:

1 Door 200, Exterior to Waiting 200, LH		3070 x 1 ¾ WxM
1 Door 300B, Exterior to Service Bay 300, LH		3070 x 1 ¾ WxM
1 Door 301B, Exterior to Vehicle & Equip Stg 301, LHR		3070 x 1 ¾ WxM
[9] Ball Bearing Hinges	(DM)	TA2714-US26D 4 ½ x 4 ½
[3] Mortise Entry Lever Lock	(SG)	Lever lockset, 84/83-8205, LNL-US26D
[3] Closer, handicap accessible	(SG)	EN351-UO x TB w/limit arm stop and manual hold-open, H/C
[3] Set Weatherstripping	(PK)	303AV-60x84
[3] Kick Plate, (Push Side)	(RW)	K1050-US32D, 10”x34" BE CSK, .050"
[3] Overhead Drip Cap	(PK)	346-60”
[3] Brush Sweep	(PK)	18062CNB-36”
[3] Threshold	(PK)	171A-60”, ADA H/C profile

Hardware Set No. [2]:

1 Door 201, Waiting 1C to Director’s Office 201, RH		3070 x 1 ¾ WxM
1 Door 203, Hall 212 to Cemetery Rep Office 203, LH		3070 x 1 ¾ WxM
1 Door 204, Hall 212 to Conference Room 204, RH		3070 x 1 ¾ WxM
1 Door 207, Hall 212 to VSO Office 207, RH		3070 x 1 ¾ WxM
1 Door 302, Service Bay 300 to Office 302, RH		3070 x 1 ¾ WxM
[15] Ball Bearing Hinges	(DM)	TA2714-US26D 4 ½ x 4 ½
[5] Mortise Office Lever Lock	(SG)	Lever Lockset, 84/83-8255, LNL-US26D
[5] Concave Wall Stop	(RW)	Wall Mounted, 403 - US26D
[5] Kick Plate, (Push Side)	(RW)	K1050-US32D, 10”x34" BE CSK, .050"
[15] Silencers	(RW)	608

Hardware Set No. [2A]:

1 Door 202, Hall 212 to Operation 202, LH		3070 x 1 ¾ WxM
[3] Ball Bearing Hinges	(DM)	TA2714-US26D 4 ½ x 4 ½
[1] Mortise Office Lever Lock	(SG)	Lever Lockset, 84/83-8255, LNL-US26D
[1] Concealed Overhead Stop	(RW)	1538S - US26D
[1] Kick Plate, (Push Side)	(RW)	K1050-US32D, 10”x34" BE CSK, .050"
[3] Silencers	(RW)	608

Hardware Set No. [3]:

1 Door 206, Hall 212 to Break Room 206, LH		3070 x 1 ¾ WxM
1 Door 303, Service Bay 300 to Break Room 303, LH		3070 x 1 ¾ WxM
[3] Ball Bearing Hinges	(DM)	TA2714-US26D 4 ½ x 4 ½
[1] Mortise Passage Lever Latch Set	(SG)	Lever Latch set, 8215, LNL-US26D
[1] Concave Wall Stop	(RW)	Wall Mounted, 403 - US26D
[1] Kick Plate, (Push Side)	(RW)	K1050-US32D, 10”x34" BE CSK, .050"
[3] Silencers	(RW)	608

Hardware Set No. [4]:

1 Door 205, Hall 212 to Family Toilet 205, RH		3070 x 1 ¾ WxM
1 Door 304, Service Bay 300 to Lockers 304, RH		3070 x 1 ¾ WxM
[3] Ball Bearing Hinges	(DM)	TA2714-US26D 4 ½ x 4 ½
[1] Mortise Privacy Function Latch Set w/ Occupancy Indicator	(SG)	Lever Latch set, 49-8265, LNL-US26D
[1] Concave Wall Stop	(RW)	Wall mounted, 403 - US26D
[1] Coat Hook	(RW)	802 - US26D
[2] Kick Plate (Both Sides)	(RW)	K1050-US32D, 10”x34" BE CSK, .050"
[1] Set Gasketing	(PK)	S88D-17’
[1] Door Bottom	(PK)	209_V_D

Hardware Set No. [4A]:

1 Door 305, Lockers 304 to Unisex 305, LH	3070 x 1 ¾ WxM	
[3] Ball Bearing Hinges	(DM)	TA2714-US26D 4 ½ x 4 ½
[1] Mortise Privacy Function Latch Set w/ Occupancy Indicator	(SG)	Lever Latch set, 49-8265, LNL-US26D
[1] Concealed Overhead Stop	(RW)	1538S - US26D
[1] Coat Hook	(RW)	802 - US26D
[2] Kick Plate (Both Sides)	(RW)	K1050-US32D, 10”x34" BE CSK, .050"
[1] Set Gasketing	(PK)	S88D-17’
[1] Door Bottom	(PK)	209_V_D

Hardware Set No. [5]:

1 Door 209, Hall 212 to Janitor 209, LH		3070 x 1 ¾ WxM
[3] Ball Bearing Hinges	(DM)	TA2714-US26D 4 ½ x 4 ½
[1] Mortise Closet Lever Lock	(SG)	Lever lockset, 84/83-8204, LNMV-US26D
[1] Concealed Overhead Stop	(SG)	1538S - US26D
[2] Kick Plate, (Both Sides)	(RW)	K1050-US32D 10”x34”, .050”ga
[3] Silencers	(RW)	608

Hardware Set No. [6]:

1 Door 1D5, Hall 212 to Mech./Elect. Room 211, RH **60-Min**		3070 x 1 ¾ WxM
[3] Ball Bearing Hinges	(DM)	TA2714-US26D 4 ½ x 4 ½
[1] Mortise Closet Lever Lock	(SG)	Lever lockset, 84/83-8204, LNMV-US26D
[1] Closer, Handicap Accessible	(SG)	EN1431-P10 x TB
[2] Kick Plate, (Both Sides)	(RW)	K1050-US32D 10”x34”, .050”ga
[1] Set Gasketing	(PK)	S88D-17’
[1] Door Bottom	(PK)	209_V_D

Hardware Set No. [7]:

1 Door 207, Hall 212 to VSO Office 207, RH		3070 x 1 ¾ WxM
[9] Ball Bearing Hinges	(DM)	TA2714-US26D 4 ½ x 4 ½
[3] Mortise Entry Lever Lock	(SG)	Lever Lockset, 84/83-8205, LNL-US26D
[3] Concave Wall Stop	(RW)	Wall Mounted, 403 - US26D
[3] Kick Plate, (Push Side)	(RW)	K1050-US32D, 10”x34" BE CSK, .050"
[12] Silencers	(RW)	608

Hardware Set No. [8]:

1 Door 213, Exterior to Men's 213, LH		3070 x 1 ¾ WxM
1 Door 213, Exterior to Women's 213, LH		3070 x 1 ¾ WxM
[6] Ball Bearing Hinges	(DM)	TA2714-US26D 4 ½ x 4 ½
[2] Push Pate	(RW)	70C-US32D
[2] Pull Handle w/ plate	(RW)	BF125x70C-US32D
[2] Deadbolt	(SG)	Deadbolt with Keyed Cylinder and Interior lever turn – US32D
[2] Closer, handicap accessible	(SG)	EN351-UO x TB w/limit arm stop and manual hold-open, H/C
[1] Set Weatherstripping	(PK)	303AV-60x84
[1] Kick Plate, (Push Side)	(RW)	K1050-US32D, 10"x34" BE CSK, .050"
[2] Brush Sweep	(PK)	18062CNB-36"
[2] Threshold	(PK)	171A-60", ADA H/C profile

Hardware Set No. [9]:

1 Door 215, Exterior to Honor Guard 215, RH		3070 x 1 ¾ WxM
[3] Ball Bearing Hinges	(DM)	TA2714-US26D 4 ½ x 4 ½
[1] Mortise Storeroom Lever Lock	(SG)	Lever lockset, 84/83-8204, LNL-US26D
[1] Deadbolt	(SG)	Deadbolt with Keyed Cylinder and Interior lever turn – US32D
[1] Closer, handicap accessible	(SG)	EN351-UO x TB w/limit arm stop and manual hold-open, H/C
[1] Set Weatherstripping	(PK)	303AV-60x84
[1] Kick Plate, (Push Side)	(RW)	K1050-US32D, 10"x34" BE CSK, .050"
[1] Overhead Drip Cap	(PK)	346-60"
[1] Brush Sweep	(PK)	18062CNB-36"
[1] Threshold	(PK)	171A-60", ADA H/C profile

Hardware Set No. [10]:

Pocket Door, 206A, Conference 206 to Brea Room 204,		3'-5" x 7'-0"
[1] Pair Pocket Door Hardware	(DM)	3'-5"x 7'-0", Commercial duty 15' long track set. Includes (2) trucks per door leaf. (4) wheels each truck
[1] Sets – Door pulls	(DM)	Door pulls each side, edge coped/latch, turn latch.

Hardware Set No. [11]:

1 Door 401, Exterior to Storage 401, RHR		3070 x 1 ¾ WxM
1 Door 402, Exterior to Elect./Stg. 402, LHR		3070 x 1 ¾ WxM
[6] Ball Bearing Hinges	(DM)	TA2714-US26D 4 ½ x 4 ½
[2] Mortise Storeroom Lever Lock	(SG)	Lever lockset, 84/83-8204, LNL-US26D
[2] Deadbolt	(SG)	Deadbolt with Keyed Cylinder and Interior lever turn – US32D
[2] Closer, handicap accessible	(SG)	EN351-UO x TB w/limit arm stop and manual hold-open, H/C
[2] Set Weatherstripping	(PK)	303AV-60x84
[2] Overhead Drip Cap	(PK)	346-60"
[2] Brush Sweep	(PK)	18062CNB-36"
[2] Threshold	(PK)	171A-60", ADA H/C profile

Hardware Set No. [12]:

1 Pair Door 301A, Service Bay 300 to Vehicle & Equip Stg 301		3070 x 1 ¾ WxM
[6] Ball Bearing Hinges	(DM)	TA2714-US26D 4 ½ x 4 ½
[1] Mortise Closet Lever Lock	(SG)	Lever lockset, 84/83-8204, LNMV-US26D
[2] Concealed Overhead Stop	(SG)	1538S - US26D

[4] Armor Plate, (Both Sides)	(DM)	KP50-US32D 34”x34”, .050”ga
[2] Silencers	(RW)	608

MISC.

10 Masterkeys	(SG)	New

END OF SECTION

DIVISION 8 - OPENINGS
SECTION 08 81 00 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Door vision lites.
   2. Window units

1.2 DEFINITIONS

A. Manufacturer is used in this Section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation.

B. Glass Design: Glass thicknesses indicated on Drawings are for detailing only. Confirm glass thicknesses by analyzing in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria:
   1. Minimum glass thickness, nominally, of lites is 6.0 mm (0.23 inch).

C. Wire Glass: Wire glass is not allowed. All new fire-rated doors & windows shall have fire-rated glazing to comply with NFPA 101: 8.2.3.2.2.

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each glass product and glazing material indicated.

C. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.
   1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

D. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.5 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. FGMA Publications: "FGMA Glazing Manual."
   2. SIGMA Publications: TM-3000 "Vertical Glazing Guidelines".

B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
   1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification

agency acceptable to authorities having jurisdiction.

C. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E 152, labeled and listed by UL or another testing and inspecting agency acceptable to Architect.

D. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
1. Insulating Glass Certification Council (IGCC).
2. Associated Laboratories, Inc. (ALI).
3. National Certified Testing Laboratories (NCTL).

E. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.

F. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:
1. Primary glass of each (ASTM C 1036) type and class indicated.
2. Heat-treated glass of each (ASTM C 1048) condition indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 WARRANTY

A. Manufacturer's Warranty on Glass Products: Warranty Period: Manufacturer's standard but not less than 5 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 HEAT-TREATED FLOAT GLASS

A. Fabrication Process: By vertical (tong-held) or horizontal (roller-hearth) process, at manufacturer's option, except provide horizontal process where indicated as tongless or free of tong marks.
1. Kind FT (fully tempered) where indicated.

B. Coated, Tinted, Heat-Treated Float Glass: ASTM C 1048, Condition C (other coated glass), Type I (transparent glass, flat), Class 2 (tinted heat-absorbing and light-reducing), Quality q3 (glazing select), with kind, coating type, and performance characteristics complying with requirements specified under coated glass products.

C. Manufacturers: Subject to compliance with requirements, provide heat-treated glass by one of the following companies.
1. Cardinal Glass Industries.
2. Guardian Glass.
3. Viracon, Inc.

2.2 INSULATING GLASS PRODUCTS

A. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other requirements indicated, including those in Insulating Glass Product Data Sheet at the end of this Section.
1. Low-E Coated Insulating Vision Glass Products, General: Performance characteristics designated for coated insulating glass products are nominal values based on manufacturer's published test data for glass products 1-inch thick. U-values are expressed as BTU/hr. per sq. ft. per degree F. Apply coatings to clear float or heat-treated tinted float glass of kind indicated or, if not otherwise indicated, Kind HS (heat strengthened) where recommended by

manufacturer to comply with system performance requirements specified. Low E coating shall be applied to #2 surface of the insulated glass unit.

2. Provide heat-treated, coated float glass of kind indicated or, if not otherwise indicated, Kind HS (heat strengthened) where recommended by manufacturer to comply with system performance requirements specified and Kind FT (fully tempered) where safety glass is designated or required by code (temper all units except clerestories).
3. Performance characteristics designated for coated insulating glass are nominal values based on manufacturer's published test data for units with lites 6.0 mm (0.23 inch) thick and nominal 1/2-inch dehydrated space between lites, unless otherwise indicated.

2.3 EXTERIOR GLASS TYPE

A. Base Building Glass: 1-inch insulated glazing.
   1. Outboard Lite: 1/4-inch HS w/Low-E Solarban 70XL (2) Solargray glass.
   2. Air Space: 1/2-inch.
   3. Inboard Lite: 1/4-inch HS clear glass.
      a. SHGC 0.19
      b. Shading Coefficient 0.22
      c. Visible Transmittance 34
      d. U Value Winter 0.28
      e. U Value Summer 0.26
      f. Visible reflectance (Exterior) 6
      g. Indoor Reflectance 12
      h. UV 2.2
      i. Solar Heat Gain 0.2

2.4 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:
   1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
   3. Colors: Provide color of exposed joint sealants to match adjacent material color.

B. Elastomeric Glazing Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements indicated on each Elastomeric Glazing Sealant Product Data Sheet at the end of this Section, including those referencing ASTM classifications for Type, Grade, Class and Uses.
   1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Glazing Sealant Product Data Sheet, provide products, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, with the capability to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

C. Glazing Sealant for Fire-Resistant Glazing Products: Identical to product used in test assembly to obtain fire-resistive rating.

2.5 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, non-staining and non-migrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800 for products indicated below:
   1. AAMA 806.1.

B. Products: Subject to compliance with requirements, provide one of the following:
   1. Back-Bedding Mastic Glazing Tape Without Spacer Rod:
      a. Dyna-Seal, Pecora Corp.
      b. PTI 626 Architectural Sealant Tape, Protective Treatments, Inc.
      c. S-M 5710 H.P Poly-Glaze Tape Sealant, Schnee-Morehead, Inc.
      d. SST-800 Tape, Tremco, Inc.

2.6 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
   1. Neoprene, ASTM C 864.
   2. EPDM, ASTM C 864.
   3. Silicone, ASTM C 1115.
   4. Thermoplastic polyolefin rubber, ASTM C 1115.
   5. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:
   1. Neoprene.
   2. EPDM.
   3. Silicone.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following companies.
   1. Preformed Gaskets:
      a. Advanced Elastomer Systems, L.P.
      b. Schnee-Morehead, Inc.
      c. Tremco, Inc.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).

F. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-extruding, non-outgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.

2.8 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.2 GLAZING, GENERAL

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions shall provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass from edge damage during handling and installation.

D. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:
   2. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.
   3. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.

3.3 GLAZING TAPES

A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sight-line of stops.

B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.

C. 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.

D. Do not remove release paper from tape until just before each lite is installed.

E. 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.

3.4 PROTECTION AND CLEANING

A. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

B. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

C. Wash glass on both faces not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION

DIVISION 9 – FINISHES
SECTION 09 05 16 - SUBSURFACE PREPARATION FOR FLOOR FINISHES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies subsurface preparation requirements for areas to receive the installation of applied sheet, tile, and resinous flooring. This section includes removal of existing non-ACM floor coverings, testing concrete for moisture and pH, remedial floor coating for concrete floor slabs having unsatisfactory moisture or pH conditions, floor leveling and repair as required.

1.2 RELATED WORK

A. Section 07 92 00 “Joint Sealants & Gasketing”

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 00 “Submittals”.

B. Written approval confirming product compatibility with subfloor material manufacturer and the flooring manufacturer

C. Product Data:
1. Moisture remediation system
2. Underlayment Primer
3. Cementitious Self-Leveling Underlayment
4. Cementitious Trowel-Applied Underlayment (Not suitable for resinous floor finishes)

D. Test Data:
1. Moisture test and pH results performed by a qualified independent testing agency or warranty holding manufacturer’s technical representative.

E. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.4 DELIVERY AND STORAGE

A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.

B. Store material to prevent damage or contamination.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only.

B. American Society for Testing and Materials (ASTM):

D638-***14***	Test Method for Tensile Properties of Plastics
D4259-*18*	Standard Practice for Abrading Concrete to alter the surface profile of the concrete and to remove foreign materials and weak surface laitance.
C109/C109M-*20b*	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens) Modified Air Cure Only
D7234-*19*	Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

E96/E96M - 16	Standard Test Methods for Water Vapor Transmission of Materials
F710-*19e1*	Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
F1869-***16a***	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
F2170-***19a***	Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
C348-20	Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars
C191-19	Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle

PART 2 - PRODUCTS

2.1 MOISTURE REMEDIATION COATING

A. System Descriptions:
1. High-solids, epoxy system designed to suppress excess moisture in concrete prior to an overlayment. For use under resinous products, VCT, tile and carpet where issues caused by moisture vapor are a concern.

B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up.

C. System Components: Verify specific requirements as systems vary by manufacturer. Verify build up layers and installation method. Verify compatibility with substrate. Use manufacturer's standard components, compatible with each other and as follows:
1. Liquid applied coating:
a. Resin: epoxy.
b. Formulation Description: Multiple component high solids.
c. Application: Per manufacturer's written installation requirements.
d. Thickness: minimum 10 mils

D. Material Vapor Permeance: Application shall achieve a permeance rating of less than 0.1 perm in accordance with ASTM E96/E96M.

E. Maximum RH requirement: 100% testing in accordance with ASTM F2170.

Property	Test	Value
Tensile Strength	ASTM D638	4,400 psi
Volatile Organic Compound Limits (V.O.C.)	SCAMD Rule 1113	25 grams per liter
Permeance	ASTM E96	0.1 perms
Tensile Modulus	ASTM D638	$1.9X10^5$ psi
Percent Elongation	ASTM D638	12%
Cure Rate	Per manufacture's Data	4 hours Tack free with 24hr recoat window
Bond Strength	ASTM D7234	100% bond to concrete failure

2.2 CEMENTITIOUS SELF-LEVELING UNDERLAYMENT

A. System Descriptions:
1. High performance self-leveling underlayment resurfacer. Single component, self-leveling, cementitious material designed for easy application as an underlayment for all types of flooring materials. It is used for substrate repair and leveling.

B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up. Gypsum-based products are unacceptable.

C. System Characteristics:
1. Wearing Surface: smooth
2. Thickness: Per architectural drawings, ranging from feathered edge to 1", per application. Applications greater than 1" require additional 3/8" aggregate to mix or as recommended by manufacturer.

D. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.

E. Compressive Strength: Minimum 4100 psi in 28 days in accordance with ASTM C109/C109M.

F. Flexural Strength: Minimum 1000 psi in 28 days in accordance with ASTM C348

G. Dry Time: Underlayment shall receive the application of flooring material per Manufacturer's Instructions (both flooring material & underlayment).

H. Primer: compatible and as recommended by manufacturer for use over intended substrate

I. System Components: Manufacturer's standard components that are compatible with each other and as follows:
1. Primer:
a. Resin: copolymer
b. Formulation Description: single component ready to use.
c. Application Method: Squeegee and medium nap roller.
All puddles shall be removed, and material shall be allowed to dry, 1-2 hours at 70F/21C.
d. Number of Coats: (1) one.
2. Grout Resurfacing Base:
a. Formulation Description: Single component, cementitious self-leveling high-early and high-ultimate strength grout.
b. Application Method: colloidal mix pump, cam rake, spike roll.
1) Thickness of Coats: Per architectural scope, 1" lifts.
2) Number of Coats: More than one if needed.
c. Aggregates: for applications greater than 1inch, require additional 3/8" aggregate to mix.

Property	Test	Value
Compressive Strength	ASTM C109/C109M	2,200 psi @ 24 hrs 3,000 psi @ 7 days
Initial set time Final Set time	ASTM C191	30-45 min. 1 to 1.5 hours
Bond Strength	ASTM D7234	100% bond to concrete failure

2.3 CEMENTITIOUS TROWEL-APPLIED UNDERLAYMENT(NOT SUITABLE FOR RESINOUS FLOOR FINISHES)

A. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.

B. Compressive Strength: Minimum 4000 psi in 28 days

C. Trowel-applied underlayment shall not contain silica quartz (sand).

D. Dry Time: Underlayment shall receive the application of flooring material per Manufacturer's Instructions (both flooring material & underlayment).

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperature of work areas at not less than 16 degree C (60 degrees F), without interruption, for not less than 24 hours before testing and not less than three days after testing.

B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation.

C. Do not install materials when the temperatures of the substrate or materials are not within 60-85 degrees F/ 16-30 degrees C.

3.2 SURFACE PREPARATION

A. Concrete shall meet the requirements of ASTM F710 and be sound, solid, clean, and free of all oil, grease, dirt, curing compounds, and any substance that might act as a bond-breaker before application. As required prepare slab by mechanical methods. No chemicals or solvents shall be used.

B. General: Prepare and clean substrates according to flooring manufacturer's written instructions for substrate indicated.

C. Prepare concrete substrates per ASTM D4259 as follows:
1. Dry abrasive blasting.
2. Wet abrasive blasting.
3. Vacuum-assisted abrasive blasting.
4. Centrifugal-shot abrasive blasting.
5. Comply with manufacturer's written instructions.

D. Verify that concrete substrates are dry.

E. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of per flooring manufactures formal and project specific written recommendation.

F. Perform in situ probe test, ASTM F2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity per flooring manufacture's formal and project specific written recommendation.

G. Provide a written report showing test placement and results.

H. Prepare joints in accordance with Section 07 92 00 "Joint Sealants & Gasketing" and material manufacturer's instructions.

I. Alkalinity: Measure surface pH in accordance with procedures provided in ASTM F710 or as outlined by qualified testing agency or flooring manufacturer's technical representative.

J. Tolerances: Subsurface shall meet the flatness and levelness tolerance specified on drawings or recommended by the floor finish manufacturer. Tolerance shall also not to exceed 1/4" deviation in 10'. As required, install underlayment to achieve required tolerance.

K. Other Subsurface: For all other subsurface conditions, such as wood or metal, contact the floor finish or underlayment manufacturer, as appropriate, for proper preparation practices.

3.3 MOISTURE REMEDIATION COATING:

A. Where results of relative humidity testing (ASTM F2170) exceed the requirements of the specified flooring manufacturer, apply remedial coating as specified to correct excessive moisture condition.

B. Prior to remedial floor coating installation mechanically prepare the concrete surface to provide a concrete surface profile in accordance with ASTM D4259.

C. Mix and apply moisture remediation coating in accordance with manufacturer’s instructions.

3.4 CEMENTITOUS UNDERLAYMENT:

A. Install cementitious self-leveling underlayment as required to correct surface defects, floor flatness or levelness corrections to meet the tolerance requirements as or detailed on drawings, address non-moving cracks or joints, provide a smooth surface for the installation of floor covering, or meet elevation requirements detailed on drawings.

B. Mix and apply in accordance with manufacturer's instructions.

3.5 PROTECTION

A. Prior to the installation of the finish flooring, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, tempered hardwood, or other suitable protection course

3.6 FIELD QUALITY CONTROL

A. Where specified, field sampling of products shall be conducted by a qualified, independent testing facility.

END OF SECTION

DIVISION 9 - FINISHES
SECTION 09 29 00 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Non-load-bearing steel framing members for gypsum board assemblies.
   2. Gypsum board assemblies attached to steel framing.
   3. Fire rated walls and ceiling systems.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 07 84 00 “Firestopping” for firestopping systems and fire-resistance-rated joint sealants.

1.2 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.3 ASSEMBLY PERFORMANCE REQUIREMENTS

A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

B. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Section 01 33 00 “Submittals”.

B. Product Data for each type of product specified.

C. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.

D. Shop Drawings: 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.

E. Welding Certificates: Copies of certificates for welding procedures and personnel.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified

G. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.

B. Single-Source Responsibility for Panel Products and Finishing Materials: Obtain each type of gypsum board and other panel products from a single manufacturer.

C. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:
1. Fire-Resistance Ratings: As indicated by GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
3. Deflection and Firestop Track: Top runner provided in fire-resistance-rated assemblies indicated is labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier. Temporary factory –applied plastic packaging **must** be removed upon receipt.

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. Neatly stack gypsum panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.

B. Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours before application and continuously after until dry. Do not exceed 95 deg F when using temporary heat sources.

C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Steel Framing and Furring:
   a. ClarkDietrich
   b. MarinoWARE
   c. Consolidated Steel
2. Gypsum Board and Related Products:
   a. Georgia-Pacific Corp.
   b. National Gypsum Co.; Gold Bond Building Products Division.
   c. United States Gypsum Co.
   d. American Gypsum

B. Products: Subject to compliance with requirements, provide one of the following products where proprietary gypsum wallboard is indicated:
1. Gold Bond XP Fire Shield; National Gypsum Co.; Gold Bond Building Products Division.
   a. Purple face paper, gray back paper (FSW)
2. SHEETROCK Brand Gypsum Panels, Mold Tough AR FIRECODE Core; United States Gypsum Co.

a. Green face paper, brown back paper (AR)
3. DensShield Tilebacker Fireguard Type X; Georgia-Pacific Corp. (DS)
4. M-Bloc® Type X; American Gypsum. (AGX-1)
5. ToughRock Type C; Georgia-Pacific Corp. (Type 5)

2.2 STEEL FRAMING FOR NON-LOAD BEARING PARTITIONS

A. General: Provide steel framing members complying with the following requirements:
1. Protective Coating: ASTM A 653, G 40 (ASTM A 653M, Z 90) hot-dip galvanized coating.

B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
1. Thickness: 0.0359 inch (20gauge) unless otherwise indicated.
2. Depth: 3-5/8 inches (92.1 mm), unless otherwise indicated.
3. Depth: 1-½ & 2-½ inch furring studs where indicated.
4. Conform to proprietary fire rated framing systems, i.e.: USG shaftwall and horizontal shaft fire rated enclosure systems. Provide UL tested system components for a complete tested fire rated assembly.

C. Furring Brackets: Serrated-arm type, adjustable, fabricated from corrosion-resistant steel sheet complying with ASTM C 645, minimum thickness of base (uncoated) metal of 0.0329 inch (0.84 mm), designed for screw attachment to steel studs and steel rigid furring channels used for furring.

D. Steel Channel Bridging: Cold-rolled steel, 0.0598-inch minimum thickness of base (uncoated) metal and 7/16-inch- wide flanges, 1-1/2 inches deep, 475 lb/1000 feet, unless otherwise indicated.

E. Steel Flat Strap and Backing Plate: Steel sheet for blocking and bracing complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M), length and width as indicated, and with a minimum base metal (uncoated) thickness as follows:
1. Thickness: 0.0598 inch (1.5 mm) where indicated.

F. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.3 GYPSUM BOARD PRODUCTS

A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
1. Widths: Provide gypsum board in widths of 48 inches (1219 mm).

B. Gypsum Wallboard: ASTM C 36 and as follows:
1. **ALL gypsum wallboard to be type "X", "M/R" & mold resistant unless noted otherwise.**
2. Type "X" Glass-mat, water-resistant backing panel where ceramic tile is to be used.
3. Proprietary type as required for specific fire-resistance-rated assemblies.
4. Edges: Tapered.
5. Thickness: 5/8 inch, minimum (15.9 mm).

C. Conform with Tested Assemblies for Fire Rated System compliance.

2.4 TRIM ACCESSORIES

A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:
1. Material: Formed metal or plastic, with metal complying with the following requirement:
a. Steel sheet zinc coated by hot-dip process or rolled zinc.
2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:

a. Cornerbead on outside corners, unless otherwise indicated.
b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
c. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.

3. Use stainless steel screws for drywall attachment to aluminum framing systems.

2.5 JOINT TREATMENT MATERIALS

A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.
1. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.

C. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
1. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
2. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer.
3. For topping compound, use sandable formulation.

D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
1. Ready-Mixed Formulation: Factory-mixed product.
a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
b. Topping compound formulated for fill (second) and finish (third) coats.
c. All-purpose compound formulated for both taping and topping compounds.

E. Acoustic Sealant for Gypsum Board: Factory-packaged acrylic, latex-based products complying with the following requirements for formulation and intended use.
1. Can be used as fire-caulk in UL classified joint systems
2. Meets ASTM C834 specifications for latex sealants
3. Surface burning characteristics of 0/0
4. Low VOC (<15 g/l)
5. Sheetrock Brand Acoustical Sealant by USG used as Basis of Design

2.6 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.

B. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.

C. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

D. Sound-Attenuation Blankets: Unfaced mineral-fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing).
1. Mineral-Fiber Type: Fibers manufactured from glass, slag wool, or rock wool.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ceiling Anchorages: Coordinate installation of above ceiling wall bracing at all interior partitions.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."

C. Isolate steel framing from building structure at non-load bearing walls to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.
   1. Where building structure abuts ceiling perimeter or penetrates ceiling.
   2. Where partition framing and wall furring abut structure, except at floor.
      a. Install deflection and firestop track top runner at fire-resistance-rated assemblies where indicated.
      b. Attach jamb studs at openings to tracks using manufacturer's standard stud clip.

3.4 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
   1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural framing or deck. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
   1. Cut studs 1/2 inch (13 mm) short of full height to provide perimeter relief.
   2. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.

D. Install steel studs and furring in sizes and at spacings indicated.
   1. Single-Layer Construction: Space studs 16 inches o.c., unless otherwise indicated.

E. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.

F. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws

either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Install 2 studs at each jamb, unless otherwise indicated.
2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (12.7-mm) clearance from jamb stud to allow for installation of control joint.
3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

3.5 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.

B. Install sound-attenuation blankets, in all walls, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

C. Install gypsum panels with face side out. Install wall panels vertically to minimize and eliminate end butt joints. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16" of open space between panels. Do not force into place.

D. Locate both edge or end joints over supports. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.

E. Attach gypsum panels to studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

F. Attach gypsum panels to framing provided at openings and cutouts.

G. Grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches wide. Apply grout at each jamb and head and immediately insert gypsum panels into frames.

H. Cover both faces of stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.

1. Fit gypsum panels around ducts, pipes, and conduits.
2. Where partitions intersect structural members projecting below underside of floor/roof and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

I. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

J. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.

1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.

K. Follow manufacturer’s instructions for installing Type X glass-mat, water-resistant backing panel.

3.6 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application: Install gypsum wallboard panels as follows:

1. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.

B. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows: Fasten with screws.

C. Double Layer: Apply 2nd layer gypsum panels with manufacturer's recommended fasteners with staggered joints.

3.7 INSTALLING TRIM ACCESSORIES

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

B. Install cornerbead at external corners.

C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
2. Install U-bead where indicated.

D. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by Architect for visual effect.

3.8 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.

B. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.

C. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
1. Level 1 - for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies. (embed tape in joint compound)
2. Level 5 - for gypsum board surfaces, unless otherwise indicated. (embed tape in joint compound, three coats of joint compound at accessories & fasteners, prime & skim coat entire surface)
   a. Note: Contractors will be allowed to use RUCO RuCoat Equalizer Plus Primer, USG First Coat primer, or approved equal, over a Level 4 finish to achieve a Level 5 appearance.

D. Use the following joint compound combination as applicable to the finish levels specified:
1. Embedding and First Coat: Ready-mixed, drying-type, all-purpose or taping compound. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose or topping compound. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.

E. Finishing Type X glass-mat, water-resistant backing panel:
1. Finish per manufacturer's instructions
2. Substrate for tile – Apply fiberglass mesh joint tape over joints. Embed tape in setting material indicated for specified tile finishes. Allow joints to dry prior to installing tile systems.
3. Substrate for paint and wall coverings, dry areas (untiled) – Apply fiberglass mesh joint tape over joints. Embed tape in setting-type joint compound or all purpose joint compound specified. Apply skim coat of setting-type joint compound over surface of tile backer for smooth finish.
4. Substrate for high-humidity finish systems (untiled) – Apply 6" wide reinforcing fabric over joints. Embed fabric in ground coat. Skim-coat tile backer surface with ground coat for smooth finish. Apply in accordance with finish coat manufacturer's instructions.
5. Substrate for wet area, water reducible epoxy coating finish (untiled) – Apply 6" wide reinforcing fabric over joints. Embed fabric in ground coat. Skim-coat with ground coat and compatible primer. Apply epoxy coatings specified as finishing step with epoxy coating

system specified.

3.9 CLEANING AND PROTECTION

A. Promptly remove any residual joint compound from adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

DIVISION 9 - FINISHES
SECTION 09 30 00 - CERAMIC TILE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Ceramic Tile.

B. Setting Materials.

C. Grout Materials.

D. Waterproof Membrane.

1.2 RELATED SECTIONS

A. Section 07 92 00 “Joint Sealants & Gasketing”.

1.3 REFERENCES

A. ANSI A108.1A - American National Standard Specifications for Ceramic Tile Installed in the Wet-Set Method with Portland Cement Mortar.

B. ANSI A108.1B - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.

C. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesive.

D. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.

E. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy.

F. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.

G. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.

H. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive.

I. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar.

J. ANSI A118.6 - American National Standard Specifications for Ceramic Tile Grouts.

K. ANSI A118.8 - American National Standard Specifications for Modified Epoxy Emulsion Mortar Grout.

L. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installations.

M. ASTM C 242 - Standard Terminology of Ceramic Whitewares and Related Products.

N. TCA (HB) - Handbook For Ceramic Tile Installation; Tile Council of America.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00 “Submittals”.

B. Product Data:
1. Tile:
a. Manufacturer's product data indicating compliance with specified requirements.
b. Manufacturer's installation instructions.
2. Setting Materials and Grout Materials:
a. Manufacturer's product data indicating compliance with specified requirements.
b. Manufacturer's installation instructions.
c. Manufacturer's Safety Data Sheets (M.S.D.S.)

C. Selection Samples:
1. Tile: For each tile type specified, minimum 4 inch by 4 inch samples indicating manufacturer's full range of colors and finishes.
2. Grout Materials: For each grout type specified, minimum 2 inch long samples indicating manufacturer's full range of available colors.

D. Quality Control Submittals:
1. Certificates:
a. Contractor's certification that:
1) Products of this section, as provided, meet or exceed specified requirements.
2) Manufacturers of products of this section meet specified qualifications.
3) Installers of products of this section meet specified qualifications.
b. Manufacturers' certifications that materials are suitable for intended use.
c. TCA Master Grade Certificates; ceramic tile.
2. Manufacturer's instructions:
a. Tile: Manufacturer's printed installation instructions.
b. Setting Materials and Grout Materials:
1) Manufacturer's printed installation instructions.
2) Manufacturer's Safety Data Sheets (M.S.D.S.)

E. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Tile Manufacturers: Minimum five (5) years documented experience producing respective products specified in this section.
2. Setting Materials and Grout Materials Manufacturer: Tile Council of America, Inc. Licensee for Dry-Set Mortar and Grouts, with minimum five (5) years documented experience producing respective products specified in this section.
3. Installer: Minimum five (5) years documented experience installing respective products specified in this section.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials on site a minimum of 24 hours before use.

B. Acceptance at site: Only materials in original containers, with seals unbroken and labels intact.

C. Store materials in dry, heated area on site in original containers, with seals unbroken and labels intact, until time of use; prevent damage to materials such as chipping, breakage, freezing, or excessive heat; prevent contamination by water, moisture, foreign matter, or other causes.

1.7 PROJECT CONDITIONS

A. Maintain ambient and surface temperatures at minimum 60 degrees F during installation of cementitious materials and for 72 hours after installation.

B. Vent temporary heaters to outside to avoid carbon dioxide damage to new tile work.

1.8 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
1. Furnish quality of full-size units equal to 5.0 percent of amount installed.

1.9 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Contractor to schedule conference at Project site.
1. Review special inspection and testing and inspecting agency procedures for field quality control, and concrete protection.
2. Meeting is to occur minimum of 2 weeks prior to installation. Owner, Architect & Manufacturer's Representative to attend.

0.10 WARRANTY

A. Construction Warranty: FAR Clause 52.246-21, "Warranty of Construction"

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
1. Crossville.
2. Daltile.
3. Fire Clay.
4. Setting Materials and Grout: Southern Grouts & Mortars, Inc.

B. Supply each specified product from a single manufacturer; supply all setting materials and grout materials from a single manufacturer.

2.2 TILE MATERIALS

A. Porcelain Tile:
1. Administration Building.
a. Toilet Room Floor (and Wall in Mens #213 and Womens #214): Stone Fiction by Crossville.
1) Color: To be selected by Architect.
2) Size: 12" x 24".
3) Base: 6" x 12" Cove Base.
b. Toilet Room Wall (Family Toilet #205): Color Wheel Classic by Daltile.
1) Color: To be selected by Architect.
2) Size: 3" x 6".
2. Maintenance Building:
a. Toilet Room Floor (Unisex #305): Access Point by Crossville.
1) Color: To be selected by Architect.
2) Size: 12" x 24".
3) Base: 4" x 12" Base.
b. Toilet Room Wall (Unisex #305): Java Joint by Crossville.
1) Color: To be selected by Architect.
2) Size: 12" x 24".

2.3 MEMBRANES AND UNDERLAYMENTS

A. Membrane Underlayment:
1. Acceptable Product: Southern Grouts & Mortars, Inc.; Southcrete No.1100 Crack Suppression and Waterproofing Kit.
2. Characteristics: Anti-fracture, load-bearing, bondable membrane material for bridging minor shrinkage cracks in substrate; conforming to ANSI A118.10.

B. Self-Leveling Cementitious Underlayment:
1. Acceptable Product: Southern Grouts & Mortars, Inc.; Self-leveling Underlayment (Cementitious).
2. Characteristics: Portland cement, modified with acrylic admixtures for improved self-leveling and curing performance.

2.4 MORTARS AND ADHESIVES

A. Latex-Portland Cement Mortar:
1. Acceptable Product: Laticrete International, Inc.; No. 254R Platinum
2. Acceptable Product: MAPEI Corporation; Ultraflex 3

2.5 GROUTS

A. Grout:
1. Acceptable Product: Mapei Bio-Block Antimicrobial (Keracolor U)
2. Acceptable Product: Laticrete SpectraLOCK PRO Grout Part AB Liquids & Part C Powders
3. Color: Architect to select color from full range of selected manufacturer’s color chart.

2.6 ACCESSORIES

A. Threshold: Aluminum or rubber transition threshold; full door frame width, full depth of frame, thickness equal to depth of tile and setting bed, one long edge beveled 45 degrees.

B. Miscellaneous Accessories: Supply additional components specified in ANSI and TCA specifications for indicated installations.

C. Metal corner for walls, base: Polished stainless steel corner trim.

D. Metal termination strips, floor: Clear aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
1. Verify that moisture content of substrates are within tolerances recommended by setting materials manufacturer.
2. Verify that horizontal substrates are formed to required slopes.
3. Verify that substrates meet requirements specified in referenced TCA details.
4. Verify that locations and widths of required expansion joints are indicated on drawings.

B. Installer's Examination:
1. Have installer examine conditions under which construction activities of this section are to be performed, including but not limited to conditions specified in paragraph above, and submit written notification if substrates or conditions are unacceptable.
2. Transmit two copies of installer's report to Architect within 24 hours of receipt of report.
3. Proceeding with construction activities of this section before unacceptable substrates and conditions have been corrected is prohibited.
4. Beginning construction activities of this section indicates installer's acceptance of substrates and conditions under which construction activities of this section are to be performed.

3.2 PREPARATION

A. Horizontal Cementitious Substrates:
1. Grind high spots of concrete slabs to achieve specified tolerances.
2. Install specified underlayment to bring horizontal substrates to specified tolerances.
3. Clean surfaces free of dust and debris; acid-etch concrete slabs.

B. Protect surface of adjacent products and materials before beginning construction activities of this section.

3.3 INSTALLATION – GENERAL

A. Install in accordance with the TCA Method indicated.

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

C. Mix and install proprietary materials in accordance with manufacturer's instructions.

D. Expansion control:
1. Form expansion control joints in accordance with TCA EJ171-95.
2. Except where saw-cut cold expansion joints are indicated on drawings or otherwise indicated, provide expansion control joints where tile abuts vertical surfaces, where tile abuts dissimilar surfaces, where structural joints or changes of materials occur in tile substrate, as indicated on drawings, and as follows:
   a. Tile expansion joints over structural joints: Provide joint in tile same width as structural joint.
   b. Provide removable joint filler strips in expansion joints; allowing mortar or grout to migrate into joint cavities is prohibited.
   c. After grout has cured, and after cleaning of tile surfaces, remove filler strips and install joint backing materials and sealers in accordance with Section 07 92 00 “Joint Sealants & Gasketing”.

E. Install tile in accordance with referenced TCA details, including specifications and references contained therein.
1. Extend into recesses, and under or behind equipment and fixtures, to form complete covering without interruptions, except as otherwise indicated.
2. Cut tiles only with powered cut-off blade and drill holes in tiles, where required, using powered carbide-tip drill bit; cut or drilled tiles having chipped or broken edges are prohibited.
3. Cut tiles less than ½ full tile dimension each way are prohibited.
4. Maintain joint widths between tiles as specified in tile manufacturer's installation instructions; use spacers at corners of tile units or factory-assembled sheets of tile units.

3.4 INSTALLATION – FLOORS

A. General:
1. Provide tile edge where floor tile abuts dissimilar floor covering materials.
2. Provide thresholds at doors and openings, except where tile is continuous between spaces; field-cut notches for door stops.
3. Unless otherwise indicated, install tile in grid pattern perpendicular and parallel to adjacent vertical surfaces, centered in space.

3.5 INSTALLATION – WALLS

A. General:
1. Set full tile units, or full factory-assembled sheets of tile units, adjacent to outside corner units; cut tile only at inside corners.
2. Unless otherwise indicated, install tile in grid pattern plumb and level.
3. Provide trim shapes as follows:
   a. Base with metal cap for walls.
   b. External corners for walls and base. (Metal)
   c. Other trim shapes specified in manufacturer's installation instructions for project conditions.
4. Where wall tile and floor tile have same modular dimensions, align wall tile joints with floor tile joints.

B. Interior Walls:
1. On cementitious wall: Dry-set or latex-portland cement mortar – see Part 2 – Products.

3.6 GROUTING

A. Cure set tile in accordance with the following:
   1. Cure tile 72 hours before grouting when temperature is low or humidity is high.
   2. Cure tile 48 hours before grouting when hot, dry conditions exist.
   3. Check bond strength of tile before grouting.

B. Grout tile in accordance with the following, using grout materials specified:
   1. See Section 2.5 for grout type.
   2. Remove grout from tile surfaces while still plastic, as grouting progresses.

3.7 CLEANING

A. After completion of setting and grouting, clean tile surfaces using cleaning methods and materials recommended by tile manufacturer and grout materials manufacturer.

B. Except as specifically recommended by both tile manufacturer and grout materials manufacturer, acid cleaning of tile and grout surfaces is prohibited; in such instance, clean tile and grout surfaces in strict accordance with manufacturers' instructions for acid cleaning, including protection of adjacent products and materials.

3.8 PROTECTION

A. Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective work.

B. When recommended by tile manufacturer, apply protective coat of neutral protective cleaner to completed tile walls and floors.

C. Protect installed tile in accordance with ANSI specifications and manufacturer's instructions; use Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

D. Remove protective coverings and rinse neutral cleaner from tile surfaces not more than 24 hours before final inspection.

END OF SECTION

DIVISION 9 - FINISHES
SECTION 09 51 23 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Ceilings consisting of acoustical tiles and exposed grid suspension systems.
2. Acoustical ceiling panels.
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

B. Related Sections:
1. Section 09 29 00 “Gypsum Board Assemblies”.
2. Mechanical – See Table of Contents for section number.
3. Electrical – See Table of Contents for section number.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Allow with improved Formability.
2. ASTM A 641Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
6. ASTM C 636 Recommended Practice for Installation for Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
9. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
10. ASTM E 1264 Classification for Acoustical Ceiling Products.
11. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
12. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
13. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Materials.

1.3 SUBMITTALS

A. Product Data: For each type of product specified.
1. Submit manufacturer’s technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples for Verification: Full-size units of each type of ceiling assembly indicated; in sets for each color, texture, & pattern specified, showing full range of variations expected in these characteristics.
1. Set of 12-inch- long samples of exposed moldings for each color and system type required.
2. Minimum 6 inch x 6 inch samples of specified acoustical panel type, pattern, and color.
3. 8 inch long samples of exposed wall molding and suspension system, including main runner and cross tees.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Product Test Reports: Indicate compliance of acoustical tile ceilings and components with requirements based on comprehensive testing of current products.

E. Research/Evaluation Reports: Evidence of acoustical tile ceiling's and components' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

F. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with or supported by the ceilings.

G. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC and AC.

H. If the material supplied by the acoustical subcontractor shall have an Underwriter's Laboratory classification of acoustical performance on every carton.

I. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed acoustical tile ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Ceiling Units and Suspension System: Obtain each acoustical ceiling tile and support system from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Fire-Test-Response Characteristics: Provide acoustical tile ceilings that comply with the following requirements:
1. Fire-response tests were performed by UL, ITS/Warnock Hersey, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
2. Surface-burning characteristics of acoustical tiles comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
   a. Flame Spread: 25 or less.
   b. Smoke Developed: 50 or less.
3. Fire-resistance-rated assemblies, which are indicated by design designations from UL's "Fire Resistance Directory," from ITS/Warnock Hersey's "Directory of Listed Products," or from listings of another testing and inspecting agency, are identical in materials and construction to those tested per ASTM E 119.
4. Products are identified with appropriate markings of applicable testing & inspecting agency.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient

temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical tiles and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
   1. Acoustical Panels: Sagging and warping.
   2. Grid System: Rusting and manufacturer's defects.

B. Warranty Period:
   1. Acoustical panels: Ten (10) years from date of substantial completion.
   2. Grid: Ten (10) years from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.9 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
   1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Acoustical Tile Ceiling Schedule at the end of Part 3.

2.2 ACOUSTICAL TILES, GENERAL

A. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
   1. Mounting Method for Measuring Noise Reduction Coefficient: Type E-400; plenum mounting in which face of test specimen is 15-3/4" away from test surface per ASTM E 795.

B. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.

C. Tile Characteristics: Comply with requirements indicated in the Acoustical Tile Ceiling Schedule at the end of Part 3, including those referencing ASTM E 1264 classifications.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, & finishes indicated that comply w/applicable ASTM C 635 requirements.

B. Metal Suspension System Characteristics: Comply with requirements indicated in the Acoustical Panel Ceiling Schedule at the end of Part 3.

C. 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.

D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.

E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Stainless Steel Wire: ASTM A 641/A 641M, soft temper.
2. Size: Select wire diameter so its stress at three 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.

F. Hanger Rods: Stainless steel.

G. Flat Hangers: Stainless steel.

H. Angle Hangers: Angles with legs not less than 7/8" wide; formed with .125" thick, aluminum.

I. Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical tile edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
1. Manufacturer: Subject to compliance with requirements, provide products by the following:
a. Armstrong World Industries, Inc.
b. CertainTeed. (Saint-Gobain)
c. USG Corporation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates & structural framing to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical tile ceilings.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer’s printed recommendations.

3.2 PREPARATION

A. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other Sections.
1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width units at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical tile ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
2. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
3. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA’s

"Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings-Seismic Zones 0-2."

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings 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 established by referenced standards and publications.
   4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
   6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
   7. Attach hangers to structural members.
   8. Space hangers not more than 48" o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8" from ends of each member.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.
   1. Screw attach moldings to substrate at intervals not more than 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system to a tolerance of 1/8" in 12'. 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. Arrange acoustical tiles as indicated on reflected ceiling plans.

G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim.
   1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
   2. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

H. Install suspension system and panels in accordance with the manufacturer’s instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.

I. Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.

J. Install wall moldings and intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

K. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.

L. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surface. Support edges by wall moldings.

3.4 CLEANING

A. Clean exposed surfaces of acoustical tile ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

B. Replace damaged and broken panels.

3.5 ACOUSTICAL TILE CEILING SCHEDULE

A. LAY-IN TILE CEILING
1. Wet formed, Mineral-Base Acoustical Tiles for Acoustical Tile Ceiling ATC-[A]: Where this designation is indicated, provide acoustical tiles complying with the following:
   a. Products:
      1) Armstrong ULTIMA #1910 2'x2' tile panels. (Non-Rated Ceilings)
      2) Certainteed Symphony M #1222-75-1
      3) USG Mars #86185
   b. Classification: Tiles fitting ASTM E 1264 for Type III, mineral base with painted finish; Form 2, cast or molded.
   c. Pattern: Tiles fitting ASTM C E 1264 pattern designation D (non-directional fissured.)
   d. Color: White.
   e. Light Reflectance Coefficient: Not less than LR 0.82.
   f. Noise Reduction Coefficient: NRC 0.55.
   g. Ceiling Attenuation Class: Not less than CAC 33.
   h. Edge Detail: Square joints.
   i. Thickness: 5/8 inch.

B. LAY-IN TILE CEILING SUSPENSION
1. Suspension System for Acoustical Tile Ceiling ATC-[A]: Where this designation is indicated, provide acoustical tile ceiling suspension system complying with the following:
   a. Products: Provide one of the following:
      1) Armstrong “Prelude XL” 15/16" suspension system
      2) Certainteed EZ Stab Classic System
      3) USG DX series
   b. Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with cold-rolled steel sheet, pre-painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G01 (Z001) coating designation; other characteristics as follows:
      1) Intermediate-duty system
   c. Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with aluminum sheet, pre-painted, other characteristics as follows:
      1) Intermediate-duty system
      2) Aluminum grid, non-corrosive.
      3) Color: White

C. LAY-IN SCRUBBABLE TILE CEILING
1. Wet formed, Mineral-Base Acoustical Tiles for Acoustical Tile Ceiling ATC-[C]: Where this designation is indicated, provide acoustical tiles complying with the following
   a. Products:
      1) Armstrong ULTIMA Health Zone #1935, square lay-in
      2) Certainteed Symphony M RX #1222-RXS-1

b. Pattern: Tiles fitting ASTM E 1264 pattern designation Type IV, Form 2, Pattern E, Fire Class A
c. Color: White.
d. Light Reflectance Coefficient: Not less than LR 0.86.
e. Noise Reduction Coefficient: NRC 0.70.
f. Ceiling Attenuation Class: Not less than CAC 38.
g. Edge Detail: Square lay-in
h. Thickness: 3/4 inch.

D. LAY-IN SCRUBBABLE TILE CEILING SUSPENSION

1. Suspension System for Acoustical Tile Ceiling ATC-[C]: Where this designation is indicated, provide acoustical tile ceiling suspension system complying with the following:
   a. Products: Provide the following:
      1) Armstrong “Prelude” 15/16" aluminum suspension system
      2) Certainteed EZ Stab Aluminum series
   b. Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with cold-rolled steel sheet, hot-dip galvanized according to ASTM A 653/A 653M, G01 (Z001) coating designation; other characteristics as follows:
      1) Intermediate-duty system
      2) Color: White

END OF SECTION

DIVISION 9 - FINISHES
SECTION 09 65 13 – RESILIENT TRANSITIONS

PART 1. - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Transition Strips

1.2 SUBMITTALS

A General: Submit each item in this Article according to the Conditions of the Contract and Section 01 33 00 “Submittals”.

B. **All** products shall be fully documented and properly submitted for BABAA Compliance.

PART 2. - PRODUCT

2.1 PRODUCT DESCRIPTION

A. Material:
1. A composition of polyvinyl chloride resin, plasticizers, stabilizers, fillers and pigments.

B. Approved Manufacturers:
1. Johnsonite/Tarkett
2. Roppe
3. Approved manufacturers per Section 01 60 00 “Product Requirements”.
4. Selected transition strips shall be ADA compliant and appropriate to abutted materials

C. Patterns and Colors:
1. Architect to select from Manufacturer’s complete catalog.

D. Size and Gauge:
1. See Product Availability charts.

E. Limitations - Transition strips should not be used in the following areas:
1. Heavy industrial and exterior areas.
2. Commercial kitchens and commercial food processing areas.
3. Where pointed spikes such as golf or track shoes will be used.
4. Where the floor will be subjected to unusually concentrated or dynamic loads.

F. Suitable for Application Over:
1. Concrete, terrazzo and other dry, structurally sound monolithic subfloors on all grade levels.
2. Suspended wood subfloor construction with approved wood underlayments, and a minimum of 18 in. (45.7 cm) well-ventilated air space below.
3. Steel, stainless steel and aluminum floors.
4. Radiant-heated subfloors with a maximum surface temperature of 85° F (29° C).

G. Unsuitable for Application Over
1. Subfloors where excessive moisture or alkali is present.
2. Wood subfloors applied directly over concrete or on sleeper-construction subfloors.
3. Lightweight aggregate concretes having a density of less than 90 lbs. per cu. ft. and cellular concretes having plastic (wet) densities over l00 lbs per cu. ft. (1442 kg/m2) or cellular concrete having a plastic (wet) density less than 100 lbs. per cu. ft. (1602 kg/m2) [94 lbs. per cu. ft. (1506 kg/m2) dry weight] or concrete having a compressive strength of less than 3500 psi (24 MPa). Concrete slabs with heavy static and/or dynamic loads should have higher design strengths and densities calculated to accommodate such loads.

2.2 TECHNICAL DATA

A. Static Load Limit - 250 lbs./sq. in. (17.6 kg/cm2)(ASTM F 970):
   1. Subfloors where excessive moisture or alkali is present.
   2. Wood subfloors applied directly over concrete or on sleeper-construction subfloors.
   3. Floors should be protected from sharp-point loads and heavy-static loads. High-heeled traffic [1000 psi (70.3 kg/cm2) or more] may visibly damage wood, resilient and other floor coverings.

B. Fire Test Data:
   1. ASTM E 648 Flooring Radiant Panel Critical Radiant Flux –0.45 watts/cm2 or more, Class I
   2. ASTM E 662 Smoke Chamber Specific Optical Smoke Density – 450 or less
   3. Numerical flammability ratings alone may not define the performance of the product under actual fire conditions. These ratings are provided only for use in the selection of products to meet the specified limits.

PART 3. - EXECUTION

3.1 INSTALLATION

A. Job Conditions:
   1. Subfloors/underlayments shall be dry, clean and smooth. They shall be free from paint, varnish, solvents, wax, oil, existing adhesive residue or other foreign matter. For more detailed requirements of concrete, wood and metal subfloors, as well as wood and trowelable underlayments, refer to Manufacturer's Installation manual.
   2. Calcium Chloride Tests for moisture must be conducted. Confirm maximum acceptable moisture emission level of 3.0 lbs. per 1000 sq. ft. per 24 hours with Manufacturer. Bond Tests should also be conducted for compatibility with the substrate. When testing for alkalinity, confirm with the Manufacturer the allowable readings for the installation are 5 to 9 on the pH scale.
   3. Temperature shall be maintained at a minimum of 65° F (18° C) and a maximum of 85° F (29° C) for 48 hours prior to installation, during installation and 48 hours after completion. A minimum temperature of 55° F (13° C) shall be maintained thereafter. Condition all flooring materials and adhesives to room temperature at least 48 hours prior to starting installation. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.

B. Procedure:
   1. Transition strips must be installed using a solvent-based contact adhesive full spread. Contact manufacturer for detailed installation instructions

3.2 MAINTENANCE

A. Contact manufacturer for detailed maintenance instructions.

3.3 WARRANTIES

A. Transition Strips to be free from manufacturing defects for five years from the date of purchase - contact Manufacturer for warranty details, limitations and exclusions.

END OF SECTION

DIVISION 9 - FINISHES
SECTION 09 65 19 – VINYL TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Luxury vinyl floor coverings.

1.2 SUBMITTALS

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

B. Shop Drawings: Show location of seams and edges. Indicate location of columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutout locations.

C. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm) sections of each different color and pattern of vinyl floor covering specified, showing the full range of variations expected in these characteristics.

D. Product Certificates: Signed by manufacturers of vinyl floor coverings certifying that each product furnished complies with requirements.

E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

F. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an installer who is competent in the technique required by manufacturer for heat-welding seams.

B. Source Limitations: Obtain each type, color, and pattern of vinyl floor covering specified from one source.

C. Fire-Test-Response Characteristics: Provide products with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per ASTM E 648.
   2. Smoke Density: Maximum specific optical density of 450 or less when tested per ASTM E 662.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver vinyl floor coverings and installation accessories to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather, upright, with ambient temperatures maintained between 50 and 90 deg F (10 and 32 deg C).

C. Move vinyl floor coverings and installation accessories into spaces where they will be installed at least 48 hours before installation, unless longer conditioning periods are recommended in writing by manufacturer.

1.5 PROJECT CONDITIONS

A. Maintain a temperature of not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in

spaces to receive vinyl floor coverings for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After post-installation period, maintain a temperature of not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

B. Do not install vinyl floor coverings until they are at the same temperature as the space where they are to be installed.

C. Close spaces to traffic during vinyl floor covering installation and for time period after installation recommended in writing by manufacturer.

D. Install vinyl floor coverings and accessories after other finishing operations, including painting, have been completed.

E. Do not install vinyl floor coverings over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive, as determined by floor covering manufacturer's recommended bond and moisture test.

F. Moisture Testing:
1. Follow ASTM F 710 “Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring”. This includes determining Moisture Levels, Relative Humidity and pH Levels, as per the ASTM specifications listed below:
   a. ASTM F 1869, Anhydrous Calcium Chloride test for Moisture levels.
   b. ASTM F 2170, Relative Humidity (RH) test using in situ probes.
   c. ASTM F 710, pH levels (test procedure 5.3.1).
2. The ASTM test frequency recommendation is 3 measures for the first 1,000 sq.ft. (92.9 sq. m) and one measure for each additional 1,000 sq. ft. (92.9 sq. m).
3. Ensure Moisture, Relative Humidity and pH tests have all been conducted according to the latest ASTM version, and measurements meet manufacturer’s specifications.
4. For all grade installations (on, above or below), it is the flooring contractor’s responsibility to ascertain that there is not too much moisture in the concrete and that it will not increase at a future date above the recommended levels. Manufacturer will not be responsible for hydrostatic pressure which may occur in the future.

1.6 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
1. Furnish quantity of full-size units equal to 5.0 percent of amount installed.

1.7 WARRANTY

A. Project Warranty: Refer to Section 01 33 00 “Submittals” for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
1. Warranty Period:
   a. Twenty (20) year limited after date of installation or substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide the products indicated:
1. Shaw Contract: Terrain II 20 mil.
2. Patcraft:Timber Grove II 20 mil.
3. Mannington Commercial: Spacia Wood 20 mil.

B. Architect reserves the right to select color/series from the entire catalogue.

2.2 INSTALLATION ACCESSORIES

A. Comply with vinyl floor covering manufacturer's written installation instructions.

B. Rubber Wall Base: Products complying with FS SS-W-40, Type I:
1. Size: 1/8" x 4" high coved rubber base, unless noted otherwise.
2. Color: As selected by Architect from manufacturer’s full color line.
3. Manufacturers:
a. Tarkett (Johnsonite)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where installation of vinyl floor coverings will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for floor covering installation and comply with requirements specified.

B. Subfloors:
1. Porous Surfaces: For construction-grade plywood, cementitious underlayments, dry concrete that is above, on or below grade, refer to ASTM F 1482 “Standard Practice for Installation and Preparation of Panel-Type Underlayment to Receive Resilient Flooring” for general guidelines.
2. Non-Porous Surfaces: For terrazzo, ceramic tile, metal, existing fully adhered non-cushion backed resilient on all grade levels except existing tile below grade, refer to ASTM F 710 for general guidelines.
3. Concrete subfloor must be smooth and flat, as imperfections in the subfloor may show through the finished flooring. All cracks, voids and undulations must be repaired prior to flooring installation with a high strength Portland cement based patching material.
4. Saw cuts must be cleaned carefully and filled with cement based compound. Flooring must not be installed over expansion joints.
5. All surfaces must be clean, dry and free of dust, grease, paint, oil, sealers and curing compounds or any other foreign material that may interfere with proper adhesion.
6. Do not use chemical adhesive removal products (chemical abatement products); their use will void the Manufacturer’s warranty.
7. Do not use dry sweep oil-based material, as the oil in the sweeping compound will interfere with the adhesion of the material to the concrete.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with vinyl floor covering manufacturer's written installation instructions for preparing substrates indicated to receive Vinyl floor coverings.

B. All surfaces to be clean, dry & free from foreign material.

C. Apply high-performance, fiber-reinforced skimcoating compound MAPEI Planiprep MRS (or approved equal)

3.3 INSTALLATION

A. Comply with vinyl floor covering manufacturer's written installation instructions.

B. Integral Flash Cove Base: Cut floor coverings per manufacturer’s instructions to form integral base of height indicated at vertical surfaces.

C. **Use manufacturer’s recommended two part solvent-free epoxy adhesive**

3.4 CLEANING AND PROTECTING

A. Comply with vinyl floor covering manufacturer's written installation instructions.

B. Contractor to perform initial maintenance. Floor to have highest no-wax luster (per Manufacturer's Maintenance instructions)

3.5 PATTERNS

A. Architect may select a total of two (2) colors.

B. Architect reserves to right to configure the Vinyl colors in borders, medallions, or curvilinear designs.

END OF SECTION

DIVISION 9 - FINISHES
SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and field painting of the following:
1. Exposed exterior and interior items and surfaces.
2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Related Sections include the following:
1. Section 05 50 00 “Metal Fabrications” for shop priming ferrous metal.
2. Section 08 11 13 “Hollow Metal Doors and Frames” for shop priming metal doors and frames.
3. Section 09 29 00 “Gypsum Board Assemblies” for surface preparation for gypsum board.
4. Divisions 22, 23, 26, 27 and 28: Painting of mechanical and electrical work is specified in individual divisions.

1.2 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
4. Semi-gloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.3 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers.
1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis/instructions for handling, storing & applying each coating material proposed for use.
3. Certifications by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

C. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
3. Submit Samples on the following substrates for Architect's review of color and texture only:
a. Gypsum Wallboard: Provide two 12-inch- square samples for each color and finish.
b. Ferrous Metal: Provide two 4-inch- (100-mm-) square samples of flat metal and

two 8-inch- (200-mm-) long samples of solid metal for each color and finish.

D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.
   1. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted.
      a. Wall Surfaces: Provide samples on at least 100 sq. ft. (9 sq. m) of wall surface.
      b. Small Areas and Items: The Architect will designate an item or area as required.
   2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
      a. After finishes are accepted, the Architect will use the room or surface to evaluate coating systems of a similar nature.
      b. Final approval of colors will be from job-applied samples.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
   1. Product name or title of material.
   2. Product description (generic classification or binder type).
   3. Manufacturer's stock number and date of manufacture.
   4. Contents by volume, for pigment and vehicle constituents.
   5. Thinning instructions.
   6. Application instructions.
   7. Color name and number.
   8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
   1. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.6 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
   1. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. (3.785 L) or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance w/ requirements, provide one of the products in the paint schedules.

B. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:
   1. Sherwin-Williams Co. (SW). (Basis for Design)
   2. Approved Manufacturer per requirements of Section 01 60 00 “Product Requirements”.

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
   1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Provide custom colors of the finished paint systems to match Architect's selected samples.

D. Architect may select up to six (6) paint colors.

E. Contractor shall include the cost to provide one (1) accent wall per room.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
   1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
   2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
   1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.
   1. Prior to attempting to remove mildew, it is recommended to test any cleaner on a small, inconspicuous area prior to use. Bleach and bleaching type cleaners may damage or discolor existing paint films. Bleach alternative cleaning solutions are advised.
   2. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply solution and scrub the mildewed area. Allow solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow surface to dry before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in

contact with your skin. Do not add detergents or ammonia to the bleach/water solution.

3. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
4. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.

B. Aluminum: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

C. Block (Cinder and Concrete): Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75 degrees F (24 degrees C). The pH of the surface should be between 6 and 9 unless the products are designed to be used in high pH environments. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound.

D. Concrete, SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

E. Cement Composition Siding/Panels: Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9 unless the products are designed to be used in high pH environments.

F. Drywall - Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.

G. Galvanized Metal: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP16 is necessary to remove these treatments.

H. Steel: Structural, Plate, And Similar Items: Should be cleaned by one or more of the surface preparations described below. These methods are used throughout the world for describing methods for cleaning structural steel. Visual standards are available through the Society of Protective Coatings. A brief description of these standards together with numbers by which they can be specified follow.

1. Solvent Cleaning, SSPC-SP1: Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
2. Hand Tool Cleaning, SSPC-SP2: Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
3. Power Tool Cleaning, SSPC-SP3: Power Tool Cleaning removes all loose mill scale,

loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.

4. White Metal Blast Cleaning, SSPC-SP5 or NACE 1: A White Metal Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
5. Commercial Blast Cleaning, SSPC-SP6 or NACE 3: A Commercial Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 33 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
6. Brush-Off Blast Cleaning, SSPC-SP7 or NACE 4: A Brush-Off Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust, and paint may remain on the surface. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods.
7. Power Tool Cleaning to Bare Metal, SSPC-SP11: Metallic surfaces that are prepared according to this specification, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. Prior to power tool surface preparation, remove visible deposits of oil or grease by any of the methods specified in SSPC-SP1, Solvent Cleaning, or other agreed upon methods.
8. Near-White Blast Cleaning, SSPC-SP10 or NACE 2: A Near White Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 5 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
9. High- and Ultra-High Pressure Water Jetting for Steel and Other Hard Materials: SSPC-SP12 or NACE 5: This standard provides requirements for the use of high- and ultra-high pressure water jetting to achieve various degrees of surface cleanliness. This standard is limited in scope to the use of water only without the addition of solid particles in the stream.
10. Water Blasting, SSPC-SP12/NACE No. 5: Removal of oil grease dirt, loose rust, loose mill scale, and loose paint by water at pressures of 2,000 to 2,500 psi at a flow of 4 to 14 gallons per minute.

I. Wood: Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.

3.3 INSTALLATION

A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.

B. Do not apply to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.

C. Apply coatings using methods recommended by manufacturer.

D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

F. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

G. Inspection: The coated surface must be inspected and approved by the Architect just prior to the application of each coat.

3.4 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

C. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

D. 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.

3.5 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish doors on tops, bottoms, and side edges the same as exterior faces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
10. Sand lightly between each succeeding enamel coat.

B. Scheduling Painting: Apply first coat after surfaces have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
3. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of entire system as recommended by the manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.

F. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces.

G. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque 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.

H. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats.

I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.6 EXECUTION

A. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

B. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
1. Prefinished items include the following factory-finished components:
a. Architectural woodwork and casework.
b. Finished mechanical and electrical equipment.

c. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
   a. Furred areas.
   b. Ceiling plenums.
   c. Pipe spaces.
3. Finished metal surfaces include the following:
   a. Anodized aluminum.
   b. Stainless steel.
   c. Chromium plate.
   d. Copper.
   e. Bronze and brass.
4. Operating parts include moving parts of operating equipment and the following:
   a. Valves, damper operators and linkages.
   b. Sensing devices.
5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
6. Fire and/or Smoke Barrier Identification: Per Rule 120-3-3-.04 State Minimum Fire Safety Standards with Modifications for Georgia:
   a. "All fire and/or smoke barriers or walls shall be effectively and permanently identified with signs or stenciling complying with the requirements of NFPA 101, 2024 Edition, Life Safety Code, Chapter 8, Section 8.2.2.5 Wall Marking and Identification".
   b. Note: Self-adhered lettering is not acceptable, conform to Section 09 91 00.

3.7 FIELD QUALITY CONTROL

A. The Owner reserves the right to invoke testing of applied materials at any time and as often as the Owner deems necessary during the period when paint is being applied.

3.8 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
   1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.9 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
   1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.10 INTERIOR PAINT SCHEDULE (Colors to be selected by Architect.)

A. Interior Ferrous Metal (Shop Primed):

1.	One Coat – Primer	SW	Pro Industrial Kem Kromik Universal Metal Primer
2.	Two Coats – Finish	SW	Pro Industrial Waterbased Alkyd Urethane Semi-Gloss

B. Interior Ferrous Metal (Not Shop Primed):

1.	One Coat – Primer	SW	Pro Industrial Kem Kromik Universal Metal Primer
2.	Two Coats – Finish	SW	Pro Industrial Waterbased Alkyd Urethane

Semi-Gloss

C. Interior Galvanized Metal:

1.	One Coat – Primer	SW	Pro Industrial Pro-Cryl Universal Primer
2.	Two Coats – Finish	SW	Pro Industrial Waterbased Alkyd Urethane Semi-Gloss

D. Interior Exposed Piping (except chrome-plate, conduit, etc.):

1.	One Coat – Primer	SW	Pro Industrial Pro-Cryl Universal Primer
2.	Two Coats – Finish	SW	Pro Industrial Waterbased Alkyd Urethane Semi-Gloss

E. Interior Wood Trim (Natural Finish):

1.	One Coat – Primer	SW	Minwax Performance Series Tintable Wood Stain
2.	Two Coats – Finish	SW	Minwax Performance Series Fast Dry Varnish Satin

F. Interior Gypsum Wall Board (Eggshell):

1.	One Coat – Primer	SW	ProMar 200 Zero VOC Interior Latex Primer
2.	Two Coats – Finish	SW	ProMar 200 HP Zero VOC Interior Latex Eg-Shel

G. Interior Gypsum Wall Board (Semi-Gloss):

1.	One Coat – Primer	SW	ProMar 200 Zero VOC Interior Latex Primer
2.	Two Coats – Finish	SW	ProMar 200 HP Zero VOC Interior Latex Semi-Gloss

H. Masonry & Concrete:

1.	One Coat – Primer	SW	Loxon Concrete & Masonry Primer
2.	Two Coats – Finish	SW	ProMar 200 HP Zero VOC Interior Latex Semi-Gloss

3.11 EXTERIOR PAINT SCHEDULE: (Colors to be selected by Architect – Premium Quality.)

A. Ferrous Metal (Shop Primed): (touch-up prime coat)

1.	Spot Prime – As needed	S-W	Pro Industrial Pro-Cryl Universal Primer
2.	Two Coats:	S-W	Pro Industrial Waterbased Alkyd Urethane Semi-Gloss

B. Ferrous Metal (Not Shop Primed):

1.	1st Coat:	S-W	Pro Industrial Kem-Kromik Universal Metal Primer
2.	2nd & 3rd Coats:	S-W	Pro Industrial Waterbased Alkyd Urethane Semi-Gloss

C. Metal, galvanized:

1.	1st Coat:	S-W	Pro Industrial Pro-Cryl Universal Primer
2.	2nd & 3rd Coats:	S-W	Pro Industrial Waterbased Alkyd Urethane Semi-Gloss

D. Exposed Piping (Except chrome-plate), Conduit, Etc.:

1.	1st Coat:	S-W	Pro Industrial Pro-Cryl Universal Primer
2.	2nd & 3rd Coats:	S-W	Pro Industrial Waterbased Alkyd Urethane Semi-Gloss

E. Tactile Warning: – Steps & Landings:

1.	1st Coat:	S-W	Armorseal Tread-Plex Primer

2.	2nd & 3rd Coats:	S-W	Armorseal Tread-Plex Acrylic Floor Coating (w/ H&C Shark Grip Slip Resistant Additive added per coat)

F. Exposed Wood: Boards, Columns, Fascia and Window Trim:

1.	1st Coat:	S-W	Exterior Oil-Based Wood Primer
2.	2nd & 3rd Coats:	S-W	Pro Industrial Waterbased Alkyd Urethane Semi-Gloss

G. Exterior Safety Strip: (Stair Nosings; H/C warning):

1.	2 Coats:	S-W	Armorseal Tread-Plex Acrylic Floor Coating (w/ H&C Shark Grip Slip Resistant Additive added per coat)

H. IPE Wood Sealer:

1. Clear Sealer for end cuts and all exposed surfaces.

END OF SECTION

DIVISION 10 – SPECIALTIES
SECTION 10 14 00 – EXTERIOR SIGNAGE

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section specifies the work required to furnish and install the indicated and specified exterior cemetery site signage systems, including, but not limited to, posts.

B. Signs shall be products of manufacturers regularly engaged in manufacturing signs of types specified.

C. Signs included are as follows:
1. Information/Regulation.
2. Orientation Map.
3. Traffic Regulatory.
4. Post and Panel.
5. Faucet Post with Sign Panel.
6. Emblems.

1.2 RELATED WORK

A. Post Setting Excavation, Material, Backfill, Section 31 20 00 “Earthwork”.

B. Concrete Bases for posts: Section 03 30 00 “Cast-In-Place Concrete”.

C. Flower Watering Station piping, appurtenances and mounting: Section 32 33 00 “Site Furnishings”.

1.3 MANUFACTURER’S QUALIFICATIONS

A. Sign manufacturer shall regularly and presently manufacture signs similar to those specified as one of their principal products. Sign manufacturer shall submit qualifications demonstrating a minimum of three years of experience manufacturing the qualifying signs and shall, if possible, demonstrate the successful manufacturing of exterior site signs installed at one or more State or National Veteran Cemeteries.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 00 “Submittals”.

B. Samples: Submit 1 set to the A/E Designer. The Contractor shall provide submittal documents that indicate each of the sign types, mounting types and materials to be used for the various combinations to be used for this project. Submittal materials shall indicate the location(s) for the various sign types including their mounting.
1. Post & panel sign mock-up, not less than 200 mm by 250 mm (8” by 10”), shall be constructed and submitted, showing typical color, texture and fonts shown on Contract Drawings. Mock-up shall show typical fabrication methods, including panel to post(s) connection. Sample shall be capable of demonstrating how the face panels can be removed, for repair or replacement, from the mounted location between the posts, for a two post sign system. Mock-ups of all other sign systems for post mounted signs shall be capable of demonstrating how the sign panels are to be removed and replaced from the posts, or mounting support system attached to the posts, without moving the posts. Post, other than concrete or stone types, shall include typical post cap secured with tamperproof screws. Top surface of the sign panel shall not contain screws or metal joints that could trap or allow water to enter the sign assembly.
2. Aluminum samples showing full range of finish colors available.
3. Color samples of each color, 150 mm x 150 mm (6 inches x 6 inches). Show anticipated range of color and texture.
4. Sample of typeface, arrow and symbols in a typical full size layout.

C. Shop Drawings: All signs showing material, finish, colors, size of members, details of construction, letter spacing, size and type, numbers, symbols or image details, and mounting details. Identify materials, show joints, welds, anchorage, accessory items, mounting and finishes. The details of construction shall clearly show how the sign is to be disassembled to replace the entire sign or just one side panel, where applicable.

D. Full size layout in full color of the Sign Panels.

E. Manufacturer's Literature and Data (Mark literature to indicate items proposed to be furnished): Signs, each type. Manufacturer's printed specifications, anchorage details, installation and maintenance instructions. Manufacturer's recommendations for mounting the Sign Panels shall be provided.

F. Manufacturer's Certificates: Provide certification from the coating installer, indicating exactly what they did to prepared the aluminum as and applied the coating(s) to the specified thickness(es). The certification shall indicate that the coating has been installed according to specific and identified contract specifications and/or approved submittal materials so it is absolutely clear what was done.

G. Sample(s) shall be submitted of sign(s) of sufficient size to show the full scaled features of each of the sign types, including frame, mounting, panels, panel mounting, sign mounting facilities, lettering, color and texture. All aluminum signs shall have full exterior Powder Coated finish, with color and quality as specified herein.

H. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.5 DELIVERY AND STORAGE

A. Package to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.

B. Deliver signs only when the site, mounting materials, and equipment are ready for installation work to proceed.

C. Store products in dry condition inside enclosed facilities.

1.6 WARRANTY

A. Sign Manufacturer shall guarantee the text and symbols applied to the powder coated aluminum for an extended warranty period of five years following final acceptance of the project. A warranty inspection shall be performed no later than one year following project final acceptance and the Contractor shall be responsible for removing and replacing any text and/or symbols identified, during the inspection, that have started to fade, chip, peel or otherwise fail. The Contractor shall remove and replace any sign panel faces with new, where the applied lettering, or the paint system itself, is causing damage to, or failure of, the paint system. All work to produce replacement sign panels with new lettering and/or paint system shall be provided at no cost to the Government, as part of the Warranty work for the signage system.

1.7 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

B. Americans with Disabilities Act - 1990, as amended and in effect as of 01-01-2009, with Georgia Amendments per 120-3-20.

C. Federal Highway Administration:
Manuals on Uniform Traffic Control Devices for Street and Highways -

Single Post Traffic Regulatory Signs.

D. American Society for Testing and Materials (ASTM):

B209-10	Aluminum and Aluminum-Alloy Sheet and Plate
B221-12	Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
B449-93(2010)e1	Standard Specification for Chromates on Aluminum

E. American Architectural Manufacturer's Association (AAMA):

AAMA 2605-05	Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum extrusions and Panels.

F. Federal Specifications (Fed. Spec.):

MIL-P-8184F	Plastic Sheet, Acrylic, Modified.
A-A-59502	Plastic Sheet, Polycarbonate

G. VA Signage Design Guide:
Section 12 National Cemetery Signs - http://wbdg.org/ccb/VA/VASIGN/signage12.pdf

PART 2 – PRODUCTS

2.1 MATERIALS

A. Aluminum, Extruded: ASTM B221, alloy 6063-T5, applicable as material.

B. Aluminum, Sheet and Plate: ASTM B209

C. Aluminum, Extrusions and Tubing: ASTM B221

D. Zinc Chromate Primer: Fed. Spec. TT-P-645.

2.2 SIGNAGE GENERAL

A. Signs shall be of type, size and design shown on the drawings and as specified.

B. Signs shall be complete with lettering, framing, and related components for a complete sign installation.

C. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.

D. Do not scale drawings for dimensions. Verify all dimensions and conditions shown by the drawings. Architect/Engineer to be notified of any discrepancy in drawing(s), in field directions or conditions, and/or of any changes required for any such related construction details.

E. The Sign Contractor, by commencing work of this section, assumes overall responsibility, as part of his warranty of work, to assure that assemblies, components and parts shown or required within the work of the section, comply with the Contract Documents. Warrant: That all components, specified or required to satisfactorily complete the installation are compatible with each other and with conditions of installations.

2.3 SIGN STANDARDS

A. Typography:
1. Type Style: Verdana Regular. Initial caps or and lower case as indicated in Drawings, unless otherwise indicated.
2. Arrow: See graphic standards in drawings.
3. Letter spacing: See graphic standards on drawings.

4. All text, arrows, and symbols to be provided in size, colors, typefaces and letter spacing shown. Text shall be a true, clean, accurate reproduction of typeface(s) shown. Text shown in drawings are for layout purposes only. Text to be installed on specific signs shall be as submitted, reviewed and finally approved in shop drawings processed as submittal materials.

B. Sign Colors and Finishes: As specified in this Specification Section and approved in the Shop Drawing & Submittal process.
1. Aluminum sign system color scheme shall have the background color of sign panels and the aluminum posts as powder coated matching existing fixtures on campus.

2.4 SIGNS TYPES

A. General: The exterior sign system shall be comprised of sign type families that are derived from Chapter 12 - National Cemetery Signs, of the VA Signage Design Guide (SDG). The sign designations used herein follow those in the SDG. The basic sign types for this project are indicated as follows:
1. NC-01 – Information/Regulations Signs.
2. NC-02 – You Are Here Orientation Map Signs.
3. NC-03 – Traffic Regulatory Signs.
4. NC-04 – Post and Panel Signs.
5. NC-10 – Dimensional Letters/Seal.

B. Location, layout and construction details for the all of the project exterior signs shall be found in the Construction Drawings. Refer to the signage details for the specific sign panel sizes, text and graphic sizes as well as the layout and content for the text and images for the respective individual signs.

2.5 TEXT AND GRAPHICS

A. There are multiple Message Layout types for some of the different size signs within the same type of sign. See the drawing layout and detail drawings for the specifics of the locations for the signs, as well as the size, types, materials and messages for the individual signs for the project.
1. Surface applied letters, numbers and graphics shall be of a published quality and life expectancy equal to or exceeding that for reflective white opaque Engineering Grade 3M™ Scotchlite™ vinyl, unless otherwise noted. Color shall match existing. indicated in Paragraph "Sign Standards" as approved during the submittal process.

B. All text and graphics for the exterior signage shall be provided in detailed submittal information. Each sign face shall be represented in scaled drawings, with exact font, letter style, font, letter spacing, graphics being shown. Only signs and or sign faces approved in the submittal process shall be manufactured.

2.6 FABRICATION

A. Design components to allow for expansion and contraction for a minimum material temperature range of 56 °C (100 °F), without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.

B. Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners whenever and wherever possible.

C. Shop fabricate so far as practicable. Joints fastened flush to conceal reinforcement, or welded where thickness or section permits.

D. Contact surfaces of connected members shall be true. Assemble so joints will be tight and practically unnoticeable, without use of filling compound.

E. Signs shall have fine, even texture and be flat and sound. Lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern. Plane surfaces shall be smooth flat and without oil-canning, free of rack and twist. Maximum variation from true plane of surface shall be plus or minus 0.4mm (1/64 inch). Restore texture to filed or cut areas.

F. Drill holes for bolts and screws. Conceal fastenings where possible. Exposed ends and edges mill smooth, with corners slightly rounded. Form joints exposed to weather to exclude water.

G. All painted surfaces properly primed. Finish coating of paint to have complete coverage with no light or thin applications allowing substrate or primer to show. Finished surface smooth, free of scratches, gouges, drips, bubbles, thickness variations, peeling, foreign matter and other imperfections.

H. Movable parts, including hardware, are be cleaned and adjusted to operate as designed without binding of deformation of members. All contact surfaces fit tight and even without forcing or warping components.

I. Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

J. Completed sign installations shall not have any exposed openings so insect nesting inside of signs will be prevented.

K. No signs are to be manufactured until final sign message schedule and location review has been completed by the Architect/Engineer & forwarded to contractor.

L. Final sign fabrication shall not proceed until samples and shop drawings detailing the sign system as it will be installed, have been submitted and approved during the submittal process.

2.7 PROTECTION OF ALUMINUM

A. Isolate aluminum in contact with or fastened to dissimilar metals other than stainless steel, white bronze or other metals compatible with aluminum by one of the following:
   1. Painting the dissimilar metal with a prime coat of zinc-chromate or other suitable primer, followed by two coats of aluminum paint.
   2. Placing an approved caulking compound, or a non-absorptive tape, or gasket between the aluminum and the dissimilar metal.

B. Paint aluminum in contact with or built into mortar, concrete, or other masonry materials with bituminous paint or zinc chromate primer.

2.8 DOUBLE-POST-PANEL SIGNS

A. Post and Panel Signs: Furnish the standard post style for each of the Post and Panel Signs, as designated in the construction drawings. The two standard types of posts are metal and concrete as follows:
   1. Metal post signs:
      a. The posts, frame and panel(s) that make up the metal post sign system shall be constructed of an aluminum tubing system with **approved post caps**. Posts and frame elements for supporting the panels at individual sign locations shall be sized using the minimum sizes, as indicated herein, or as indicated on the drawings, with the drawing sizes taking precedence. The minimum size for the metal posts, if not indicated in the drawings, shall be 50 mm x 100 mm x 3 mm (2-inch by 4-inch by 1/8”).
      b. The minimum size for the tubular aluminum frame system (extruded slide body frame), if not indicated in the drawings, shall be 25 mm x 25 mm x 3 mm (1-inch x 1-inch x 1/8-inch) with the 3 mm(1/8 – inch) aluminum sign panels anchored to the tubular aluminum frame system, with all corners mitered and welded and ground smooth. When the sign panel system is mounted to the

posts, there shall be no openings for insects to enter. Mounting holes for attaching the sign panel and frame to the posts shall be pre-drilled before the coating system is applied. The entire sign panel and frame system (sign cabinet assembly) shall be coated with the submitted and approved powder coating system, as indicated herein or on the drawings. The sign panels shall be secured to the frame system with tamperproof screws and each panel face shall be removable, without removing the sign cabinet assembly from the posts.

c. Sign cabinet assembly shall be constructed with extruded aluminum support channels and fasteners that secure a removable powder-coated aluminum sign panel assembly. Aluminum sign panel faces shall be 3 mm (1/8") minimum thick, unless noted otherwise in the construction drawings. The design for the sign panel system shall be such that the sign panels can be removed and replaced, without having to move the posts that secure the sign panel assembly. The sign panel assembly shall be constructed so there are no gaps or holes in the assembly that could let insects enter and construct nests or otherwise become a nuisance. The top of the sign panel assembly shall be constructed such that it is water tight from above and shall not have unsealed joints where water can collect or enter the assembly. The sign configuration and mounting shall be as depicted in the drawings.

d. Lettering shall be as indicated on the applicable "Signs and Wayfinding" Drawings.

e. Exposed fasteners shall be stainless-steel, tamper-proof type, and shall be colored to match the color for the sign panels.

f. Finishes of exposed aluminum surfaces:

1) Pretreatment: Before the finish is applied, a five-stage pretreatment must be applied to assure maximum adhesion and corrosion resistance:
   a) Stage 1: High alkaline cleaner to prepare the surface
   b) Stage 2: Water rinse
   c) Stage 3: Combination of chromic, phosphoric and hydrofluoric acids that produce the chrome-phosphate conversion coating for maximum adhesion and corrosion resistance.
   d) Stage 4: Water rinse
   e) Stage 5: Water rinse

2) Coating: The coatings for the metal signs shall produce results that meet or exceed the testing results indicated in AAMA 2605-05. After pretreatment, the metal is dried and paint is then applied. The aluminum shall have an electrostatically applied baked-on flexible acrylic finish that meet or exceeds industry standard tests, achieving a 75 – 125 micron (3.0 – 5.0 mil) thickness, super-tough finish with maximum exterior durability and superior adhesion characteristics. Color as indicated on the drawings and approved submittal.

3) Tests:
   a) AAMA 2605-05 (covers Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum extrusions and Panels)
   b) ASTM D2247 (Humidity resistance of 1,000 hours)
   c) ASTM B117 (Salt spray resistance of 1,000 hours)
   d) Accelerated weathering for 500 hours under Method 6152 of Federal Test Method 141 shall show no adhesion loss, with only slight fading, chalking and water staining.
   e) Outdoor weathering shall show no adhesion loss, checking or crazing, with only slight fade and chalk when exposed for one year in Florida facing south at a 45 degree angle.
   f) Minimum hardness of 2H using ASTM D3363.
   g) Color of exposed portions of fastenings shall match sign panel being attached.

2.9 SINGLE-POST TRAFFIC REGULATORY SIGNS

A. Signs shall be constructed of square tubular galvanized steel post with an aluminum plate sign panel.

B. Sign panel shall be a 2 mm (0.080") aluminum plate with surface applied reflective vinyl traffic regulatory decals. Panel, text & graphics shall comply with the Department of Transportation, Manual for Uniform Traffic Control Devices in color, shape, proportions, text and symbols. Panel shall mechanically fasten to support post with tamper resistant fasteners. Onsite "STOP" signs shall use all caps, unless specifically directed otherwise by the Project Manager.

C. Posts shall be a minimum thickness of 2.5 mm (12 gauge) finished as specified on the Drawing Detail(s).

2.10 BRONZE PLAQUES - SERVICE EMBLEMS

A. Furnish and install the Bronze Plaques, and Emblems as indicated on the contract drawings. Bronze elements shall be cast of a lead free tin bronze, such as C900300 (Navy "G" Bronze) or similar alloy approved by the VA. The Bronze elements shall be BAS relief casting based upon the electronic graphic image included in the contract drawings as submitted and approved.

B. BAS relief castings shall be of uniform quality and condition, free from injurious blow holes and porosity, cracks and other defects and not warped or distorted, well finished, free from burrs, sharp edges, scratches and defects that may affect appearance or service ability. Casing shall not be repaired, plugged, welded or burned. Finish to be detailed, hand chased for true alignment, filed, belt polished, sides ground smooth, raised surfaces and borders to be polished and buffed to a bright satin finish, background textures to be reverse medium pebble background, fine pebble background, moss as cast. Bronze to be chemically oxidized to a statuary medium color and finish with one coat of clear protective exterior metal lacquer. Fasteners to be corrosion resistant metal compatible with material or casting. Details for the size, thickness, content, and mounting for the Bronze signage elements shall be as indicated on the contract drawings and as described as follows:"

1. Service Emblem Plaques - The six bronze service emblem plaques shall be of the sculpted BAS relief style. The six emblems include one of each military branch: Army, Marine Corps, Navy, Air Force, US Space Force, and Coast Guard. Shop drawings, as well as samples of material showing color, texture and border, and photos of sculpted molds of all sculpted BAS relief elements shall be submitted for approval prior to fabrication.
    a. Plaques shall be provided with four threaded bosses, 13 mm x 50 mm (1/2" x 2") nominal size. Space as shown on Contract Drawings. Contractor shall provide threaded bronze bolts, 13 mm x 50 mm (1/2" x 2") nominal size to fit treaded bosses.
    b. Accepted Manufacturers:
        1) The United States Space Force emblem must be obtained from a company holding an official US Air Force and/or Space Force license and are in compliance with the terms of their license agreement.
        2) All emblems must be obtained from a company licensed by the relevant military service trademark licensing program office(s).

2.11 CAST PLAQUE:

A. Scope: The project shall include a cast plaque to be installed by Contractor with actual design and lettering for the plaque to be determined by Owner.

B. Acceptable Manufacturer:
1. A.R.K. Ramos Architectural Signage Systems. (Basis of Design)
2. Gemini Incorporated.
3. Erie Landmark Co.
4. Other approved manufacturers.

C. Characteristics:
1. Plaque Material: Cast Bronze
2. Plaque Size: Per Drawings.
3. Letter Style: Times Roman/Times Roman Bold
4. Border Style: Single
5. Background Texture: Leatherette Texture
6. Plaque Finish: Bronze
7. Plaque Mounting: Concealed Mount

2.12 FAUCET POST WITH SIGN

A. Faucet posts with signs are non-illuminated pylon style with attached message and graphic decals. The decals are mounted directly on the pressure treated wood post on a separate metal panel attached to the concrete post.

B. The posts contain and/or are used to mount the water pipe and the spigot at the Flower Watering Stations. Details for the water pipe, appurtenances, and mounting are included in the related Section 32 33 00 “Site Furnishings”.

C. The posts shall be a pressure treated wood post, with location, materials, color, messages and configuration as indicated on the Drawings. Position sign to provide pedestrians with a clear unobstructed view of the sign, or position according to the drawings, if so indicated.
1. Details for the Faucet Posts with Signs are as indicated on the drawings and associated notes.
2. Faucet Posts shall match existing.

D. "Do Not Drink" decal - The "Do Not Drink" decal shall be the universal symbol with a faucet above a glass with water, and a red circle and diagonal line through the symbol. Decal has black background with white text and black and red symbol. The text "Do Not Drink" shall be stacked vertically below the international symbol. Decal shall be aligned vertically to fit the metal or concrete post location, as submitted and approved.

2.13 VERTICAL/HORIZONTAL YOU ARE HERE MAP

A. Each graphic panel shall be sized to fit onto the designated panel sign as indicated on the Drawings.

B. Graphics for these panels shall be as indicated on the drawing details and final graphics will be provided by the designer prior to the submittal process.

C. Graphic process shall be performed by a manufacturer that regularly produces similar products using materials, colors and sizes as indicated, and has performed this work for a minimum of three years. The graphics process shall produce sign panels that are curable, UV resistant, have crisp colors, shall not delaminate, be designed so surfaces scratches do not remove or damage the graphics, have been used for similar signs that have been exposed to the elements while mounted tipped up from horizontal to facilitate viewing, and have performed without failure for long periods of time. The longer the performance life of comparable products used elsewhere, the better. Minimum acceptable performance of similar signs shall be 10 years or more. Samples of the graphic sign panel, with the colors and detail that will be provided for the final sign shall be submitted, reviewed, modifications made as required, and eventually approved if fully compliant, prior to the signs being manufactured. The graphics process shall be surface applied reflective vinyl for text, map is surface silkscreened on the large format "printer/plotter" print on vinyl with UV resistant ink and clear UV resistant overcoat adhered to a powder coated aluminum panel.

D. Colors for the graphic image shall be white and necessary colors to create the map as indicated in the graphic file provided by the design A/E.

2.14 OUTDOOR BULLETIN DISPLAY CABINET

A. Manufacturers:

1. Outdoor Display Cases.
2. Approved Equal.

B. Outdoor, weatherproof, fully encased aluminum framed cabinet, 3’ W. x 4’H. Single door construction with full length piano hinge and security cam lock. Provide (2) keys.

C. Wall Mounted to Split-faced CMU; portrait orientation. Use clear sealant to seal perimeter of cabinet to split-faced CMU.

D. Finishes:
1. Aluminum Cabinet: Bronze.
2. Cork Board Interior Panel: Buff.

E. Break resistant acrylic.

F. Cabinet to have weep holes and perimeter gaskets.

G. Floral Regulations Signage:
1. Printed on PVC material; single sided.
2. Ink shall be UV-cured ink.
3. Dimensions: See drawings for details.

2.15 TRAFFIC REGULATORY – TALL

A. Sign faces shall be 450mm x 300 mm (1'-4" x 12") and shall be mounted so the bottom of message panel is 2.1m (7'-0") above finished grade.

B. These signs shall match existing.

C. Text and graphics shall be white surface applied vinyl of same material used for the text on the other signs.

D. The post for mounting the message panels shall be as indicated on the drawings.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Set work accurately, in alignment and where shown. Signs shall be plumb, level, free of rack and twist and set parallel or perpendicular as required to line and plane the surface.

B. Signs shall be installed with direct burial of post into concrete as shown on Contract Drawings. Depth of posts shall be such that the bottom of the concrete surrounding the posts is at least below the frost, or as indicated in the drawings, whichever is the greater depth.

C. Protect aluminum in contact with dissimilar metals or mortar as specified in Paragraph "Protection of Aluminum".

D. Furnish setting drawings and instructions for installation of anchors and for the positioning of items having anchors or sleeves to be built into construction. Provide temporary bracing for such items until permanent anchors are set.

E. Provide anchoring devices and fasteners as shown and as necessary for securing signs to construction as specified.

F. Utilize approved layout template for the installation of the cast metal lettering on the entry wall. Pins shall be securely anchored as detailed. Face of all lettering shall be in a constant plane, while at the same time minimizing the distance between the back of the letters and the stone wall. Maintain a minimum gap as detailed between the back of the letter and the face of the stone wall.

G. Verify that behind or beneath each sign location there are no utility lines, or other buried infrastructure elements, that will be affected by installation of signs. Any damage during installation of signs to utilities, or other buried infrastructure will be the sole responsibility of the Contractor to correct and repair.

H. Furnish inserts and anchoring devices which must be set in concrete or other material for installation of signs. Provide setting drawings, templates, instructions and directions for installation of anchorage devices which may involve other trades.

I. Sign message panels shall be mounted using tamper-proof mechanical fasteners that are coated and colored to match the message panels.

J. Install permanent caps on top of all aluminum posts.

K. Mounting details and materials shall be provided as samples during the submittal process, and complete demonstration of all of the installation features, materials and methods shall be provided during the submittal process.

3.2 PLAQUE INSTALLATION

A. Install plaques as detailed on Contract Drawings and as follows:
1. For all plaques, a 25 mm (1-inch) diameter hole shall be drilled in the unit masonry or stone to receive the mounting pins. The plaque/emblems shall be attached with non-shrink grout placed into the holes with the plaques/emblems being set when the mortar is wet. Contractor shall hold the plaques until the mortar has set. The plaques shall be set no more than 6 mm (1/4 inch) from the mounting substrate and shall be set plumb. A template of the mounting pins shall be made for each installation and the locations transferred to the masonry or stone substrate and locations approved by the owner's designated representative before the mounting holes are drilled.
2. Provide samples and drawings indicating all details of the installation as part of the submittal process. Submittals shall be revised and resubmitted until approved, and installation shall not proceed without approved submittals and/or samples.

3.3 CLEANING

A. After installation, all items shall be cleaned as recommended by the manufacturer and protected from damage until completion of the project.

3.4 PROTECTION

A. Protect finished surfaces from damage during fabrication, erection and after completion of the work.

END OF SECTION

DIVISION 10 - SPECIALTIES
SECTION 10 17 10 - SOLID PHENOLIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Solid phenolic toilet compartments.

B. Solid phenolic urinal screens.

1.2 RELATED SECTIONS

A. Drawings and general provisions of the contract.

B. General and Supplementary conditions.

C. Division 1 Specification Sections.

D. Section 10 28 13 “Toilet Accessories”.

1.3 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings for fabrication and erection, templates and instructions for installation of anchorage devices build into other work.

B. Product Data:
1. Submit manufacturer’s detailed technical data for materials, fabrication and installation.
2. Submit catalog cuts or hardware, fasteners, anchors and accessories.

C. Samples:
1. Submit full range of standard color samples for each type of unit required.
2. Submit 6" square samples of each color and finish on same substrate used in work, for color verification after selections have been made.
3. Submit one (1) sample of each of the following:
   a. Hardware (Complete).
   b. Pilaster (12" x 12").
   c. Divider panel (12" x 12").

D. Quality Assurance:
1. Field Measurements: Take field measurements prior to approval of Shop Drawings where possible, to ensure proper fitting of work. Allow for adjustments within specified tolerance where taking field measurements before fabrication might delay work.
2. Coordination: Furnish inserts and anchors to be built into other work for installation of toilet partitions and related work; coordinate delivery with other work to avoid delay.
3. Finish Schedule: Refer to and coordinate with finishes indicated to be installed as designed by finish schedule; make allowances for ceramic wall tile and tile wainscots where they exist.
4. Delivery and Storage:
   a. Adequately package and protect material during shipment. Upon arrival at job site, contractor will inspect material for damage. Remove damaged material from site and replace at no cost to Owner.
   b. Store material flat and in a dry ventilated area until installation.

E. Warranty:
1. Provide manufacturer’s standard ten (10) year warranty covering products herein specified.

F. Fire Code Compliance:
1. Submit certification that product specified herein meets or exceeds the requirements for

Class “A” flame spread rating calculated according to ASTM E-84-91A.

G. **All** products shall be fully documented and properly submitted for BABAA Compliance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Columbia Partitions, by Partitions Systems, Inc., P.O. Box 1118, Columbia, SC 29202

B. Rockville Partitions, 668 Southlawn Lane, Rockville, MD

C. Bobrick Washroom Equipment, Inc.

D. Scranton Products

2.2 MATERIALS

A. General: Provide material which has been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.

B. General: Furnish standard doors, panels, screens and pilasters fabricated for partition system, complete with all accessories and hardware listed above and as required for installation of fully functional system, unless otherwise indicated. Furnish units with cutouts, accessories, and grab bars, as indicated.

C. Material shall be solid phenolic with high pressure melamine matte finish surface made as an integral part of the core material. Laminated surfaces are not acceptable.

2.3 SOLID PHENOLIC MATERIALS

A.

Doors – Minimum	3/4" Finished thickness
Dividers Panels Minimum	1/2" Finished thickness
Pilasters - Minimum	3/4" Finished thickness

B. Door Dimensions: Unless otherwise indicated, furnish 24" wide in-swinging doors for ordinary toilet stalls and 32" wide (clear opening) out-swinging doors at stalls equipped for use by handicapped.

C. Overhead Braced Partitions:
1. Continuous, satin anodized, heavy duty, extruded aluminum head rail with anti-grip profile and integral reinforcing channel. Furnish continuously across front of all partitions and end of last partition and handicapped stall. Furnish at mid point of alcove stall where necessary to provide lateral bracing.
2. Furnish Stainless Steel Heels complete with leveling devices to permit structural connections to the floor. Make provisions for setting and securing continuous extruded aluminum anti-grip overhead bracing at top of each pilaster. Furnish shoe at each pilaster to conceal supports and leveling devices.

D. Brackets: Mounting brackets shall be heavy duty full 58" high die-cast aluminum.

E. Anchors and Fasteners: Fasteners shall have stainless steel theft-resistant type heads and be thru-bolted unless noted otherwise.

F. Urinal screens to be wall and floor mounted.

2.4 HARDWARE

A. Hardware: Provide all hardware and fasteners for a complete installation.

B. Hinge: Hinges shall be full high 58" 14 gauge, w/ 1/4" pivot pin, 304 stainless steel, spring loaded,

self closing.

C. Pilaster Shoes: ASTM A 167, type 302/304 stainless, min. 3" high, 18 gauge, finished with #3 polish, attached with through bolts.

D. Strike and Keeper: 11 ga. Cast, stainless steel, surface mounted with integral rubber bumper door stop. Strike to be surface mounted on exterior face of pilaster at standard partitions and on interior face of pilaster on handicapped stalls.

E. Slide Latch: 11 ga. cast heavy duty, stainless steel, surface mounted.

F. Coat Hook: 11 ga. cast heavy duty stainless steel, furnish one per door. Suicide prevention safety type pin.

G. Door Stop: 11 ga. cast heavy duty stainless steel. Provide separate door stop for out swinging handicapped toilet partition doors.

H. Toilet Tissue Dispensers: Specified in Section 10 28 13 “Toilet Accessories”.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install partitions rigid, straight, plumb and level in accordance with manufacturer’s instructions.

B. Set units with not more than ½ inch (12 mm) between pilasters and panels and not more than 3/4 inch (19 mm) between panels and walls.

C. Overhead-Braced and Floor-Mounted: Secure to structural concrete floor and masonry walls.
1. All anchorages shall resist 200 lb vertical loading without damage.
2. All urinal partitions shall resist horizontal force of 200 lbs without failure.

D. Adjust and lubricate hardware for proper operation after installation.
1. Set hinges on in-swing doors to hold door in open or closed position when unlatched as shown on drawings.
2. Set hinges on out-swing doors to return to the fully closed position.
3. Remove protective plastic coating.
4. Smooth and round all sharp edges for a complete and safe installation.

3.2 CLEAN AND INSTRUCT

A. Clean all installed work and replace any damaged materials.

B. Instruct Owner’s maintenance staff in the proper care and maintenance required for all parts and accessories in accordance with manufacturer’s instructions.

END OF SECTION

DIVISION 10 - SPECIALTIES
SECTION 10 26 50 - WALL SURFACE PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of wall surface protection systems:
   1. Protection systems, including:
      a. Wall protection.

1.2 SUBMITTALS

A. General: Submit the following in accordance with Section 01 33 00 Submittals.

B. Product data for each wall surface protection system component and installation accessory required, including installation methods for each type of substrate. Provide written data on each required component including physical characteristics, such as durability, resistance to fading, and test reports for fire and smoke testing.

C. Samples for Verification Purposes: Submit the following samples, prepared from the same material to be used in the Work, for verification of color, pattern, and texture selected and for compliance with requirements indicated:
   1. 12-inch-long samples of each type of corner guard required.

D. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has previously installed protection systems similar in material, design, and extent to the systems indicated for this Project.

B. Fire Performance Characteristics: Provide wall surface protection system components that are identical to those tested in accordance with ASTM E 84 for the fire performance characteristics indicated below. Identify wall surface protection system components with appropriate markings from the testing and inspection organization.
   1. Flame Spread: 25 or less.
   2. Smoke Developed: 450 or less.
   1. U.L.-723 tested,(ASTM-E84-91a), Classified and Labeled: Class 1 Fire Rating

C. Impact Strength: Provide wall surface protection system components with a minimum impact resistance of 25.4 ft. lbs per sq. ft. when tested in accordance with ASTM D 256 (Izod impact, ft. lbs per inch notch).

D. Single Source Responsibility: Obtain each color, grade, finish, and type of wall surface protection system component from a single source with resources to provided products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, and fire hazard classification.

B. Store protection materials in original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
   1. Maintain room temperature within the storage area at not less than 70 deg F during the period plastic materials are stored. Keep sheet material out of direct sunlight to avoid surface distortion.

1.5 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
   1. Furnish quality of full-size units equal to 5.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: See specific products below.

2.2 MATERIALS

A. Fiberglass Reinforced Plastic (FRP) Panels:
   1. Subject to compliance with project requirements, manufacturers offering plastic sheeting or fiberglass reinforced plastic (FRP) panels which may be incorporated in the Work include the following:
      a. Valto Engineered Materials – Glasboard.
      b. Glasteel, by Stabilit America.
      c. Approved Manufacturer per Section 01 60 00 “Product Requirements”.

B. Aluminum Extrusions: Provide alloy and temper recommended by the manufacturer for the type of use and finish indicated, but with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.

C. Fasteners: Provide aluminum, nonmagnetic stainless steel, or other non-corrosive metal screws, bolts, and other fasteners compatible with aluminum components, hardware, anchors, and other items being fastened. Use theft-proof fasteners where exposed to view.

2.4 WALL COVERING

A. Fiberglass Reinforced Plastic (FRP):
   1. Class A.
   2. Use: Walls.
   3. Surface Finish: Smooth.
   4. Scratch Resistance, ASTM D 2583, Barcol Hardness: 55.
   5. Abrasion Resistance, Taber Abrasion Test, CS-17 abrasive wheels with 1,000 g weight: Weight loss after 25 cycles of no more than 0.038 percent.
   6. Impact Strength, ASTM D 5420: 11.0 in-lbs (0.58 J), showing no visible damage on finish side.

B. Product Description:
   1. Nominal 1/8” thick, embossed finish, Class A Fire Rated panels.
      a. Panel size: 4’x8’
   2. Provide Manufacturer’s trim, joining and cap accessories.
   3. Install panels in strict accordance with Manufacturer’s reccommendations.

C. Architect to select color based on selected manufacturer's colors.

2.5 FABRICATION

A. General: Fabricate wall and door protection systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thicknesses of components.

B. Provide surfaces free of evidence of wrinkling, chipping, uneven coloration, dents, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions in which wall surface protection components and wall protection systems will be installed. Complete all finishing operations, including painting, before beginning installation of wall surface protection system materials.

B. Do not proceed with installations until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install wall surface protection units plumb, level, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished work.

B. Conform to manufacturer’s installation instructions and procedures.

C. Seal all exposed joints.

D. Install all caps and accessories for a complete assembly.

E. Reconfigure & terminate or extend existing combination handrails at new or deleted wall openings.

3.3 CLEANING

A. General: Immediately upon completion of installation, clean plastic covers and accessories using a standard ammonia based household cleaning agent. Clean metal components in accordance with the manufacturer's recommendations.

B. Remove excess adhesive using methods and materials recommended by manufacturer.

C. Remove surplus materials, rubbish, and debris resulting from installation upon completion of work and leave areas of installation in neat, clean condition.

END OF SECTION

DIVISION 10 - SPECIALTIES
SECTION 10 28 13 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUBMITTALS

A. The following shall be submitted in accordance with Division 1 Section 01 33 00 “Submittals”:
   1. Finishes; Accessory Items,
   2. Manufacturer's descriptive data and catalog cuts indicating materials of construction, fasteners proposed for use for each type of wall construction, mounting instructions, and operation instructions.

1.2 GENERAL REQUIREMENTS

A. Each accessory item shall be complete with the necessary mounting plates, anchors, and fasteners. Concealed mounting plates shall be of sturdy construction with corrosion-resistant surface.

B. Anchors and Fasteners: Anchors and fasteners shall be capable of developing a restraining force commensurate with the strength of the accessory to be mounted and shall be well suited for use with the supporting construction. Where exposed fasteners are permitted, they shall have oval heads and finish to match the accessory, except exposed fasteners shall be of tamperproof design.

C. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver items in manufacturers original unopened protective packaging.

B. Store materials in original packaging until installed.

C. Handle to prevent damage to finish surfaces.

D. Maintain protective coverings until installation is complete and ready for final cleaning.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide accessories as shown in Section 3.4. No exceptions will be allowed.

2.2 FINISHES

A. Finishes on metal shall be provided as follows:

1.	Metal: Stainless steel	Finish: No. 4 satin finish
2.	Concealed copper alloy, and brass:	Finish: Chromium plated, bright

PART 3 - EXECUTION

3.1 PREPARATION

A. Check openings and coordinate with wall construction. Verify dimensions, plumbness of blocking or frames, and other work related to installation of accessories.

B. Verify spacing of plumbing fixtures and partitians that affect installation of accessories per ADA Handicap installation requirements.

C. Do not begin work on toilet accessory installation until surfaces are acceptable.

3.2 INSTALLATION

A. Toilet accessories shall be securely fastened to the supporting construction in accordance with the approved submittals. Accessories shall be protected from damage from the time of installation until acceptance. All exposed fasterners shall be tamper-proof.

B. Install manufacturer's recommended anchor system for all grab bars and other accessories.

C. Conceal evidence of drilling, cutting and fitting on adjacent finishes.

D. Fit flanges of accessories snugly over wall surfaces and tighten to waterproof joint.

E. Install all accessories per A.D.A. Handicap requirements and per GA 120-3-20.

3.3 ADJUST AND CLEAN

A. Clean and polish all exposed Toilet accessories.

B. Adjust operating parts for proper operation.

C. Deliver accessory schedules, keys and parts manuals as part of project close-out documents.

D. Operation and Maintenance Data: Furnish the following items, 2-copies:
1. Technical data sheets of each item.
2. Complete service and parts manuals.
3. Name of local representative to be contacted in the event of need for field service or consultation.
4. Manufacturer's guarantee forms for all items.

3.4 TOILET ACCESSORY SCHEDULE

TA-1	Mirror	Bobrick #B-165 2436	40” to bottom of unit, maximum
TA-2	Soap Dispenser (Manual)*	Bobrick #B-412	Operable portion @ 48” A.F.F.
TA-3	Paper Towel Dispenser (Std)*	Bobrick #B-262	Operable portion @ 48” A.F.F.
TA-4A	Grab Bar 36”	Bobrick #B-6806x36	33” – 36” (A.F.F.) to center
TA-4B	Grab Bar 42”	Bobrick #B-6806x42	33” – 36” (A.F.F.) to center
TA-4C	Grab Bar Corner (36”L x 24”L)	Bobrick #68616	33” – 36” (A.F.F.) to center
TA-5	Toilet Tissue Dispenser (Std)*	Bobrick #B-4288	Operable portion @ 18” A.F.F.
TA-6	Coat Hook	ASI #10-7340-B	48” A.F.F.
TA-7	Shower Curtain Rod (Straight)	Bobrick #B-207x36	
TA-8	Shower Seat (Folding)	Bobrick #5181	16” – 18” (A.F.F.) to center
TA-9	Baby Changing Station (Horiz)	Koala Kare #KB310-SSWM	

*These items to be provided by Owner. Contractor to provide blocking.

END OF SECTION

DIVISION 10 – SPECIALTIES
SECTION 10 42 50 – TACTILE SIGNS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of signs:
   1. Interior Signs.

1.2 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

C. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, layout, reinforcement, accessories, and installation details.
   1. Provide message list for each sign required, including large-scale details of wording and lettering layout.
   2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
   3. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.

D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.
   1. Samples for verification of color, pattern, and texture selected and compliance with requirements.

1.3 QUALITY ASSURANCE

A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.

C. Design Concept: The Drawings indicate room locations. Sign schedule indicates sign sizes, profiles, and dimensional requirements of signs and are based on the specific types indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Interior Sign Manufacturers:
      a. Architectural Signage (ATL.) Basis of Design:
         1). Custom Fabricated, Laminated, Engraved, 3-color solid plastic sign.
         2). Colors: Match Existing.
         Ph: (800) 533-9075, Ext. No. 1430
         Web: www.archsign.com
      b. Advance Process Supply Company.
      c. Andco Industries Corp.
      d. ASI Sign Systems, Inc.
      e. Intelligent Signage, Inc.

f. Signmark Graphics.

2.2 MATERIALS

A. Materials for interior signs shall be Custom Fabricated, Laminated, Engraved, 3-color solid plastic sign.
1. Corian
2. Avonite
3. Wilsonart

B. Color for interior signs:
1. Copy color: Match Existing.
2. Emergency oriented signs shall have red background plaques. Red shall be Advance Process Supply Company ABS-520, Satellite Red.

C. Graphic Data for interior signs:
1. All copy shall be upper and lower case as shown in the attached Exhibits “A”. Letter size shall be the height indicated on the schedule of individual sign types unless face dimensions and message dictate otherwise. Copy shall be arial and comply with ADAG handicap requirements.
2. Room numbers and permanent sign letters shall be raised 1/32" as required by A.D.A. Refer to drawings of individual sign type for requirements.
3. Typography shall follow guidelines established in the attached drawings and sign manufacturer’s approved ADA signage.
4. Design shall be vandal resistant & "pick-proof."

D. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.

E. Aluminum Extrusions: Provide aluminum extrusions of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.

F. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

G. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

H. Cast aluminum letters:
1. Anodize aluminum
2. Style: Baskerville Old Face - upper and lower case.
3. Provide products meeting this specification from one of the following Manufacturer’s:
   a. A.R.K. Ramos
   b. Gemini Inc.
   c. Metal Arts
   d. OMC Industries, Inc.
   e. The South Well Co.
   f. Rohm-Hass
4. Adhere to brick.
5. Color: To be determined by Architect from standard colors.
6. Letter Size: 5" high lower case. 8" high upper case.

2.3 ASSEMBLY

A. Interior Signs:
1. Sign components shall be fully adhered to back plates.

a. Mechanically attach to wall, or door as indicated.

2. Window type signs shall provide for copy change and shall be composed of a sheet of 1/16" clear matte acrylic that is sub-surface printed, except for the window area, with both (permanent) message and background color, prior to being laminated to a slotted base of 1/8" thick opaque acrylic (except as otherwise noted on attached sign drawings). The slotted base shall have 1 3/8" milled slots as required for individual signs. The slots shall receive a copy insert strip of matching color. Windows shall be 1". (Slots formed of several pieces or laminated Plexiglas are not acceptable)

3. Copy insert strips for signs shall be 1/16" matte acrylic, surface printed. Insert strips shall have square edges for proper fit in slots.

2.4 SIGN COMPONENTS

A. Interior Signs: Schedule of Room Number and Identification Signs required: (See attached Sign Schedule at end of Part 3. Sign sizes shall match wording length requirements.

NOTE: Owner to verify sign types & wording prior to purchasing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Locate sign units and accessories as scheduled, using mounting methods of the type described and in compliance with the manufacturer's instructions.

1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

B. Plates for interior signs shall be mounted to walls with double-sided adhesive foam tape. Signs shall be mounted level with top at 5'-0" above finish floor and 2" from door frame on strike side of frame.

3.2 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

3.3 INTERIOR SIGN SCHEDULE:

A. Type A - Room number ADA H/C Braille.

B. Type B - Room number with changeable message panel, ADA H/C Braille.

C. Type C - Toilet Room (Boys/Girls) with ADA H/C Symbol with Braille.

D. Type D - Room number with permanent message panel, ADA H/C Braille.

E. Provide the following interior wall mounted signs and provide Braille.

ROOM NAME	SIGN TYPE	TEXT	SYMBOL
ADMINISTRATION BUILDING			
CEMETERY REP OFFICE	B	CEMETERY REP	
OPERATION	B	OPERATIONS	
DIRECTOR’S OFFICE	B	DIRECTOR’S OFFICE	
CONFERENCE ROOM	D	CONFERENCE ROOM	
FAMILY TOILET	C	TOILET	M, W, H/C
BREAK ROOM	D	BREAK ROOM	
VSO OFFICE	B	OFFICE	
JANITOR	A	ROOM NUMBER	

MECH./ELECT.	A	ROOM NUMBER	
MENS	C	MEN	M, H/C
WOMENS	C	WOMEN	W, H/C
HONOR GUARD	D	HONOR GUARD	
OPEN COMMITTAL SHELTER			
STROAGE	D	STORAGE	
ELECTRICAL	D	ELECTRICAL	
MAINTENANCE BUILDING			
OFFICE	B	OFFICE	
BREAK ROOM	D	BREAK ROOM	
LOCKERS	D	LOCKERS	
UNISEX	C	TOILET/SHOWER	M, W, H/C
JANITOR	A	ROOM NUMBER	

END OF SECTION

DIVISION 10 - SPECIALTIES
SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Semi-recessed Fire extinguishers with cabinets. (FEC)
2. Surface mounted fire extinguishers with mounting brackets. (FE)

1.2 SUBMITTALS

A. General: Submit the following according to Section 01 33 00 “Submittals”.

B. Product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

C. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.

B. Coordination: Verify that cabinets are sized to accommodate type and capacity of extinguishers indicated and provided by Owner under separate Contract.

C. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

D. FM-Listed Products: Fire extinguishers approved by Factory Mutual Research Corporation for type, rating, and classification of extinguisher with FM marking.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Elkhart Brass Mfg. Co., Inc.
2. J.L. Industries.

2.2 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, which comply with authorities having jurisdiction.

B. Multipurpose Dry Chemical Type: UL-rated 4A:80B:C, MP10lb nominal capacity, in enameled steel container.

2.3 CABINETS

A. Construction: Manufacturer's standard box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld all exposed joints and grind smooth. Miter and weld perimeter door frames.

B. Fire-Rated Cabinets: UL listed with UL listing mark with fire-resistance rating of wall where it is installed.

C. Cabinet Type: Suitable for containing Fire extinguisher. Semi-recessed: Cabinet box (tub) partially recessed in walls of shallow depth. Fully welded corners and ground with matching brushed stainless steel finish.

D. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Rolled-edge trim with 2-1/2-inch backbend depth. Trim Metal: Stainless steel, ASTM A 167, AISI Type 302/304 alloy.

E. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
1. Stainless Steel: Manufacturer's standard door construction, fabricated from austenitic stainless steel complying with ASTM A 167, for AISI Type 302/304 alloy. Door Glazing: Fully tempered float glass complying with ASTM C 1048, Condition A, Type I, Quality q3, Kind FT, Class as follows: Class 1 (clear).

F. Identify fire extinguisher in cabinet with FIRE EXTINGUISHER lettering applied to door. Provide lettering to comply w/authorities having jurisdiction for letter style, color, size, spacing, and location.

G. Door Style: Manufacturer's standard design: Full-Glass Panel: Float glass, 1/8 inch thick, FT.

H. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide exposed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 deg.

2.4 FINISHES FOR CABINETS, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying temporary strippable protective covering prior to shipping.

2.5 STAINLESS STEEL CABINET FINISHES

A. Remove or blend tool and die marks and stretch lines into finish.

B. Grind and polish surfaces to produce uniform-directional, textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece. (Exposed joints not permitted.)
1. Bright, Directional Polish: AISI No. 4 finish.

C. Passivate and rinse surfaces after polishing. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Follow manufacturer's printed instructions for installation.

B. Install in locations and at mounting heights to comply with applicable regulations of governing authorities.
1. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim

and to comply with manufacturer's instructions.

3. Comply with protected recess in fire rated walls.
4. Provide height for Handicap access to fire extinguishers in accordance with ADA GA as adapted by the State of Georgia.
5. Fasten cabinets to structure, square and plumb.
6. When extinguisher is mounted by bracket on a freestanding column:
   a. Contractor to paint column “red” starting at 7’-0” AFF, and ending aligned with bottom of extinguisher
   b. Contractor to paint all visible faces of column.

END OF SECTION

DIVISION 10 - SPECIALTIES
SECTION 10 51 13 - METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Two (2) tier lockers with (1) ADA compliant unit.
2. 72” tall with base (or approved equal).
3. ADA Compliant bench.

1.2 SUBMITTALS

A General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: Manufacturer's printed data including materials, accessories, construction, finishes, assembly, and installation instructions for lockers and benches.

C. Shop Drawings: Layout and dimensions of metal lockers. Indicate relationship to adjoining surfaces. Show locker elevations and details, fillers, trim, base, sloping tops, and accessories. Include locker numbering sequence. Indicate installation and anchorage requirements.

D. Samples for Color Verification: Samples showing actual colors prepared on same material to be used for the Work.

E. Maintenance Instructions: Instructions for cleaning lockers and for adjusting, repairing, and replacing locker doors and latching mechanisms.

F. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain locker units and accessories from one manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver lockers until spaces to receive them are clean, dry, and ready for locker installation.

B. Protect lockers from damage during delivery, handling, storage, and installation.

C. Deliver master keys, control keys, and combination control charts to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
1. American Locker
2. De Bourgh Manufacturing Co.
3. Lyon Workspace (Basis of Design).
4. Penco Products.
58. List Industries, Inc.

2.2 MATERIALS

A. **Steel Sheet:** All parts made from prime grade mild cold rolled sheet steel free from surface imperfections, and capable of taking a high-grade enamel finish.

B. **Hinges:** 074" thick, 2" high, double spun, full loop, tight pin, five-knuckle hinges, projection welded to door frame and securely fastened to the door with 2 steel rivets. Doors over 42" high shall have three hinges, all other doors shall have two hinges.

C. **Finishing:** Chemically pretreat metal with a six-stage cleaning phosphatizing and metal preparation process. Finish coat shall be electrostatically applied powder coat enamel baked on at 350 to 400 degrees. Select colors from manufacturer's minimum standard 21 colors. All lockers shall be painted inside and outside with the same color.

D. **Equipment:** Coat hooks and coat rods are zinc plated. Truss fin head bolts and hex nuts are zinc plated.

E. **Fabrication – General Construction:** Built on the unit principle - each locker shall have an individual door and frame, individual top, bottom, back and shelves with common intermediate uprights separating compartments. Lockers shall be fabricated square, rigid and without warp. Doors shall be flat and free of distortion.

F. **Door Frame:** All door frame members to be not less than 16 gauge formed to a channel shape. Vertical members to have an additional flange to provide a continuous door strike. Intermembering parts to be mortised and tenoned and electrically welded together in a rigid assembly capable of resisting strains. Cross frame members of 16 gauge channel shapes including intermediate cross frame on double and triple tier lockers shall be securely welded to vertical framing members to ensure rigidity.

G. **Body:** Bolt spacing in locker body construction not to exceed 9" o.c. All locker body components shall be made of cold rolled steel specially formed for added strength and rigidity and to ensure tight joints at fastening points. Tops & bottoms shall be 24 gauge with three sides formed 90 degrees and the front offset formed to be flush with the horizontal frame member. Shelves shall be 24 gauge with four sides formed to 90 degree, the front edge shall have a second bend. Backs & sides shall be 24 gauge.

H. **Doors:** Doors 20" or higher shall be formed from one piece 16 gauge cold rolled sheet steel. Formations shall consist of a full channel shape on the lock side of adequate depth to fully conceal the lock bar, channel formation on the hinge side, and right-angle formations across the top and bottom. Doors over 15" wide x 60" or 72" high shall have a 3" wide 20 gauge full height reinforcing pan welded to the inside face of the door on 6" centers. Doors less than 12" wide shall be 18 gauge.

I. **Door Handle & Latching:** Handles shall be recessed in the door and be finger lift control. The 20 gauge drawn pocket shall be brushed stainless steel securely fastened to the door with two tabs plus a positive tamper resistant decorative fastener. The pocket shall be of sufficient depth to prevent a combination padlock, built-in combination lock or key lock from protruding beyond the face of the door. A lock hole cover plate shall be provided for use with padlocks. The lifting piece shall be 14 gauge formed steel, attached to the latching channel with one concealed retaining lug and one rivet assuring a positive two-point connection. Handle finger lift shall have a padlock eye for use with a 9/32" diameter padlock shackle. It shall have a sound deadening molded comfortable finger lift attached. Doors to have latch clip engaging the door frame at three points on 60"& 72" high and two points on 20" through 36" high doors. Locking device to be positive, automatic type, whereby locker door may be locked when open, then closed without unlocking. One rubber silencer shall be firmly secured in the frame at each heavy gauge latch hook. Latch clips shall be glass filled nylon for long life and low friction and shall hold doors shut by engaging the latch hooks. The latch channel assembly shall be quieted by the use of unique nylon glides to reduce noise.

J. **Ventilation:** Shall be facilitated by air flow slots located in the top & bottom flange of the door. The door front shall be flush with no exposed louvers.

K. **Number Plates:** Each locker door to be supplied with a polished aluminum number plate, 2-1/4" wide x 1" high, with black numerals not less than 3/8" high. Number plates shall be attached to the face of the door with two aluminum rivets.

L. **Interior Equipment:** Single tier lockers 60" or higher shall have a hat shelf located approximately 9"

below the top of locker; if less than 18" deep, locker shall have three single-prong hooks and one double-prong ceiling hook. Single tier lockers 18" or more in depth shall have a coat rod instead of a ceiling hook. 30" & 36" high lockers shall have three single-prong wall hooks and one double-prong ceiling hook. Hooks to be steel, ball tip zinc plated, attached with two bolts per hook. 20" & 24" high lockers to have three wall hooks for 12" wide and four wall hooks for 15" and wider.

M. **Locker Accessories:** Lockers shall be furnished with the accessories selected from the Accessory Specifications.

N. **ADA Compliant Lockers:** Handicap lockers shall have recessed handles and shall be single tier or the lower opening of a double tier locker. Locker bottom shall be a minimum of 9" off the floor, or an extra shelf placed 9" off the floor. Single tier lockers shall have a shelf 48" off the floor. Doors assigned for handicapped use shall have an appropriate symbol sign

O. **Confirm with Architect the need for slating top pieces, toe plates & other architectural/ design features.**

P. Bench: Durable hardwood top with (4) steel pedestals. Supports up to 150 lbs. per linear foot. Anchoring bolts are to be included.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install metal lockers complete with accessories according to manufacturer's recommendations. Install plumb, level, rigid, and flush.

B. Assemble lockers with standard fasteners according to manufacturer's recommendations with no exposed fasteners on door faces and face frames.

C. Anchor lockers to floors and walls at intervals recommended by manufacturer but no greater than 36 inches (910 mm). Install anchors through back-up reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.

D. Install recess trim to recessed lockers using concealed fasteners. Provide hairline joints and concealed splice plates.

E. Install sloping top units to lockers using concealed fasteners. Provide hairline joints and concealed splice plates.

F. Install finished end panels to conceal exposed ends of non-recessed lockers.

3.2 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

B. Clean interior and exposed exterior surfaces and polish nonferrous metal surfaces.

C. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.

D. Touch up marred finishes or replace locker units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION

DIVISION 10 – SPECIALTIES
SECTION 10 75 00 – FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fixed high dimensional, ground set, uniform conical taper, seamless tube flag pole.

1.2 RELATED WORK

A. Section 03 30 00 “Cast in Place Concrete”: Concrete for Ground Set Flagpole.

B. Section 31 20 00 “Earthwork”: Excavation and Backfill.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):
7-16 Minimum Design Loads for Buildings and Other Structures.

C. ASTM International (ASTM):
A240/A240M-20 Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
B209-14 Aluminum and Aluminum-Alloy Sheet and Plate.
B209M-14 Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
B241/B241M-16 Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
C33/C33M-18 Concrete Aggregates.
C920-18 Elastomeric Joint Sealants.

D. Master Painters Institute (MPI):
No. 35(2020) Bituminous Coating.

E. National Architectural Metal Manufacturers(NAAMM):
AMP 500-06 Metal Finishes Manual.
FP 1001-07 Guide Specifications for Design of Metal Flagpoles.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 00 “Submittals”.

B. Submittal Drawings:
1. Show size and installation details for flagpole, base, and finial ball.

C. Manufacturer's Literature and Data:
1. Description of each product.
2. Installation instructions.

D. Qualifications: Substantiate qualifications comply with specifications.

E. **All** products shall be fully documented and properly submitted for BABAA Compliance.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
1. Installed specified products with satisfactory service on five similar installations for minimum five years.

a. Project Experience List: Provide contact names and addresses for completed projects.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in state where work is located.

B. Design flagpole assemblies complying with specified performance:
1. Wind Loads: NAAMM FP 1001.
2. Seismic Loads: ASCE/SEI 7.

C. Approved Manufacturer’s:
1. Flag Co.
2. Freedom Flag & Pole.
3. Concord American Flagpole.

2.2 MATERIALS

A. Aluminum, Extruded: ASTM B241/B241M, Alloy 6063 - T6.

B. Aluminum, Plate and Sheet: ASTM B209, Alloy ll00.

C. Stainless Steel: ASTM A167, Class 302 or 304.

2.3 FABRICATION

A. Fabricate flagpole of seamless extruded aluminum tube, uniform conical taper of approximately 1 in 70 (1 inch in every 72 inches).
1. Maximum Taper: 50 percent of flagpole outside base diameter.
2. Sectional Flagpoles: Provide self-aligning sleeves for field joint.
3. Height: As specified on Drawings.

B. Base: Aluminum plate or stainless steel, of stock design as indicated on drawings.

C. Finial Ball: 2 mm (0.08 inch) thick spun aluminum sphere, with seams welded flush and watertight. Mount ball on threaded rod to fit truck.
1. Ball Diameter: Match flagpole butt diameter.

D. Truck: Equip pole with extra heavy, revolving, non-fouling, ball bearing type truck with cast aluminum body. Fit truck with two cast aluminum, nylon bushed sheaves on stainless steel axles.

E. Halyards: Two sets of 9 mm (3/8 inch) diameter, nylon braided rope with minimum two bronze swivel snaps for each halyard.

F. Cleats: Two aluminum cleats minimum 225 mm (9 inches) long. Secure cleats to pole with two 9 mm (3/8 inch) flat head aluminum machine screws.

G. Foundation Sleeve: Galvanized, corrugated steel, length as indicated on drawings, welded to steel base plate.
1. Weld lightning ground rod of 19 mm (3/4 inch) diameter galvanized steel to base plate at bottom of sleeve.

H. Flashing Collar: Material and finish to match flagpole.

I. Lightning Kit: Provide a complete kit (maximum protection available) for each pole. Configuration and components for the kit shall be as recommended by the pole manufacturer for use on the pole selected.

2.4 FINISHES

A. Finish flagpole exposed surfaces.

B. Stainless Steel: NAAMM AMP 500; No. 4 polished finish.

C. Aluminum Anodized Finish: NAAMM AMP 500.
1. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick.

D. Aluminum Satin Finish: NAAMM AMP 500.
1. Mechanical Finish: AA-M323 Directional Textured, Coarse Satin and AA-M20, Buffed.

E. Flagpole Shaft: Satin aluminum finish, then heavily waxed.

F. Finial Ball: Gold color anodized aluminum, then heavily waxed.

G. Base and Cleats: Finish to match flagpole.

2.5 ACCESSORIES

A. Sand: ASTM C33/C33M.

B. Sealant: ASTM C920, elastomeric type recommended by flagpole manufacturer.

C. Bituminous Paint: MPI No. 35.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Excavate flagpole foundations as specified in Section 31 20 00 “Earthwork”.

C. Provide foundation tube for installation as work of Section 03 30 00 “Cast in Place Concrete” for installation in flagpole footing.

D. Place concrete as specified in Section 03 30 00 “Cast in Place Concrete”.

3.2 INSTALLATION

A. Install products according to manufacturer's instructions and approved submittal drawings.

B. Coat flagpole section within foundation sleeve with bituminous paint.

C. Install galvanized, corrugated steel sleeve or tube of detailed length, welded to steel base plates for installation in concrete. Set base plate and Lightning Kit in place before concrete is placed. Follow the manufacturer's recommendations for the installation of the lightning kits.

D. Install foundation plate and centering wedges for flagpole base in concrete base and fasten.

E. Install concrete foundation work to dimensions indicated in accordance with Section 03 30 00 “Cast-In-Place Concrete”.

F. Wrap top of sleeve with two layers of asphalt felt for distance of 600 mm (2 feet) down.

G. Install flagpole in accordance with manufacturers written installation instructions. Install pole plumb using centering wedges.

H. Backfill and compact excavation around flagpole base in accordance with Section 31 20 00 “Earthwork”.

I. Fill and thoroughly compact dry fine sand into the space between pole and steel sleeve and tamp to within 50 mm (2 inches) of top of sleeve.

J. Remove temporary wood positioning wedges and fill upper 50 mm (2 inch) space between pole and steel sleeve with specified or manufacturer recommended waterproofing compound.

K. Install fittings in accordance with manufacturer’s written installation instructions.

L. Check and adjust installed fittings for smooth operation of halyards.

3.3 LIGHTNING ROD

A. Weld lightning ground rod of 19 mm (3/4 inch) diameter galvanized steel to base plate at bottom of sleeve or tube, and to steel support plate at grade.

3.4 CLEANUP

A. After installation, carefully clean the flagpole and appurtenances, removing all dirt stains, and all other incident defacements.
   1. Fabricator should be contacted regarding the use of any cleaners and must approve of them before use.
   2. Protection of Finished Work: Flagpoles for this project shall be protected at all times during construction.

B. Clean up area of excess material and debris.

END OF SECTION

DIVISION 11 - EQUIPMENT
SECTION 11 45 10 - APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Appliances for break rooms.

B. Related Sections include the following:
   1. Division 22 Section "Water Distribution Piping" for plumbing connections to appliances.
   2. Division 22 Section "Drainage and Vent Piping" for drainage plumbing connections to appliances.
   3. Division 26 Section "Low Voltage Conductors and Cables" for services and connections to appliances.

1.2 SUBMITTALS

A. Product Data: For each appliance type required indicating compliance with requirements. Include complete operating and maintenance instructions for each appliance.

B. Appliance Schedule: Submit schedule of appliances, using same room designations shown on Drawings.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experiences installer who is an authorized representative of residential appliance manufacturer for both installation and maintenance of appliances required for this Project.

B. Source Limitations: Obtain residential appliances through one source from a single manufacturer.
   1. Provide products from the same manufacturer for each type of appliance required.
   2. To the greatest extent possible, provide appliance by a single manufacturer for entire Project.

C. Product Options: Drawings indicate sizes, profiles, and dimensional requirements of residential appliances and are based on the specific types & models indicated. Manufacturers' appliances with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

D. Electrical Appliances: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

E. UL and NEMA Compliance: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.

F. AHAM Standards: Provide appliances that comply with the following AHAM standards:
   1. Refrigerators: Total volume and shelf area ratings certified according to ANSI/AHAM HRF-1.

1.4 DELIVERY

A. Deliver appliances only after utility rough-in is complete and construction in the spaces to receive appliances is substantially complete and ready for installation.

1.5 WARRANTIES

A. General Warranty: 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.

PART 2 – PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, appliances that be incorporated into the Work include, but are not limited to, those indicated in the Appliance Schedule at the end of Part 3.
   1. GE Appliances
   2. Whirlpool
   3. Maytag
   4. Ice-O-Matic

2.2 APPLIANCES

A. Microwave ovens: Freestanding microwave oven demounted under counter, listed by UL, and complying with requirements specified in the Appliance Schedule.

B. Refrigerator: Full size with 2 doors, top freezer, bottom refrigerator compartments, and floor mounted.

C. Washer: Heavy duty, 2-cycle, installation kit for hot water, cold water, drain and all standard equipment.

2.3 FINISHES

A. Porcelain-Enamel Finish: Provide manufacturer's standard factory-applied porcelain-enamel finish over cleaned and pretreated steel sheet. If no color is indicated, provide black.
   1. Color and Gloss: As selected by Architect
      a. Where appliances by more than one manufacturer are installed in the same space, provide units with color matching the largest equipment item.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for plumbing, mechanical, and electrical services, with Installer present, to verify actual locations of services before residential appliance installation.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Utilities: Refer to Division 22 and 26 for plumbing and electrical requirements.

E. Connections:
   1. Use braided stainless steel hoses for washer supply.
   2. Use metal vent flexible piping with 2-S.S. adjustable screw clamps to connect to exhaust duct and vent to exterior.

3.3 ADJUSTING AND CLEANING

A. Test each item of residential appliances to verify proper operation. Make necessary adjustments.

B. Verify that accessories required have been furnished and installed.

C. Remove packing material from residential appliances and leave units in clean condition, ready for operation.

3.4 APPLIANCE SCHEDULE

A. Microwave Oven: Provide microwave ovens complying with the following:
   1. Products: GE JES1657SMSS
   2. Type: Freestanding 1.6 cubic feet
      a. Controls: Electronic touch.
      b. Clock type: Digital.
   3. Standard features include the following:
      a. Cooking complete reminder.
      b. 1150 watts
   4. Color: Stainless Steel

B. Refrigerator:
   1. Products: Whirlpool WRTX5419SZ
      a. Type: Freestanding 19.3 cubic ft. refrigerator with freezer compartment.
   2. Provide with shelves and clear-view drawers.
   3. Provide dual temperature controls.
   4. Color: Stainless Steel

C. Ice Maker:
   1. Products: Ice-O-Matic
   2. Type: CIM0430FA90
      a. Voltage: 115/60/1
      b. Condensing Type: Air
      c. Ice Type: Full Cube
      d. Production: 300 lbs. min.
      e. Bin: B40-344 lbs. storage min.

END OF SECTION

DIVISION 11 – EQUIPMENT
SECTION 11 70 00 - SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes service equipment indicated on Drawings and schedules.

B. Using Agency Furnished Equipment: Where indicated, using Agency will furnish equipment items.

C. Related Sections include the following:
1. Section 05 50 00 "Metal Fabrications" for equipment supports.
2. Refer to Division 22 Sections for supply service roughing-ins; drain traps; valves, pipes, & fittings; and other materials required to complete service equipment installation.
3. Refer to Division 26 Sections for connections to wiring, disconnects, and other electrical materials required to complete service equipment installation.

1.2 SUBMITTALS

A. Product Data: For each type of service equipment indicated. Include manufacturer's model number and accessories and requirements for access and maintenance clearances, water and drainage, power or fuel, and service-connections including roughing-in dimensions.

B. Shop Drawings: For service equipment not manufactured as standard production and catalog items by manufacturers. Include plans, elevations, sections, roughing-in dimensions, fabrication details, service requirements, and attachments to other work.
1. Wiring Diagrams: Details of wiring for power, & control systems & differentiating between manufacturer-installed and field-installed wiring.
2. Piping Diagrams: Details of piping systems and differentiating between manufacturer-installed and field-installed piping.

C. Coordination Drawings: For locations of service equipment & service utilities. Essential equipment with item numbers & descriptions indicated in Contract Documents. Include plans & elevations of equipment, access-/maintenance-clearance requirements, details of concrete or masonry bases, floor depressions, and service-utility characteristics. Show all piping, fittings, and utilities.

D. Samples for Initial Selection: Manufacturer’s color charts showing the full range of colors available for exposed products with color finishes.

E. Maintenance Data: Operation, maintenance, & parts data for service equipment to include in maintenance manuals specified in Division 1. Include a product schedule as follows:
1. Product Schedule: For each service equipment item, include item number & description indicated in Contract Documents, manufacturer's name and model number, and authorized service agencies' addresses and telephone numbers.
2. Provide video of on-site training to using Agency.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing service equipment, who has completed installations similar in design and extent to that indicated for this Project, and who has a record of successful in-service performance.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing service equipment similar to that indicated for this Project and with a record of successful in-service performance.

C. Source Limitations: Obtain each type of service equipment through one source from a single manufacturer.

D. Product Options: Drawings indicate service equipment based on specific products indicated. Other manufacturers' equipment with equal size & performance characteristics may be considered. Refer to E-03 General conditions for substitutions and prior approval submittal requirements.

E. Regulatory Requirements: Comply w/the following National Fire Protection Association (NFPA) codes:
1. NFPA 54, "National Fuel Gas Code."
2. NFPA 70, "National Electrical Code."

F. Listing and Labeling: Provide electrically operated equipment or components specified in this Section that are listed and labeled.
1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

G. ASME Compliance: Fabricate & label steam-generating & closed steam-heating equipment to comply with ASME Boiler and Pressure Vessel Code.

H. ANSI Standards: Comply w/applicable ANSI standards for electric-powered & gas-burning equipment; for piping to compressed-gas cylinders; and for plumbing fittings, including vacuum breakers to prevent siphonage in water piping.

I. Seismic Restraints: Provide seismic restraints for service equipment.

J. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to service equipment including, but not limited to, the following:
1. Review access requirements for equipment delivery.
2. Review equipment storage and security requirements.
3. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
4. Review structural loading limitations.
5. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver service equipment as factory-assembled units with protective crating and covering.

B. Store service equipment in original protective crating and covering and in a dry location.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of service equipment installation areas by field measurements before equipment fabrication and indicate measurements on Shop Drawings and Coordination Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 COORDINATION

A. Coordinate equipment layout and installation with other work, including light fixtures and HVAC equipment.

B. Coordinate location and requirements of service-utility connections.

C. Coordinate size, location, and requirements of structural supports and concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

D. Coordinate installation of equipment supports, and reinforcing.

1.7 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents & shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Warranty Period: 1 year from date of Architects Final Certificate, including "Maintenance Service" required for equipment and systems specified.

PART 2 - PRODUCTS

2.1 SERVICE EQUIPMENT SCHEDULE

A. [M.57]: Flammables Safety Cabinet (located at Maintenance Building).
1. Self closing, 45-gallon capacity.
2. 2-adjustable shelves, 2-doors, and leak proof sill.
3. Size: 18"L x 43"W x 65"H.
4. Color: Safety yellow with warning labels.
5. Complies with OSHA & NFPA for flammable storage cabinets.
6. Distributor: Fisher Scientific 800-766-7000.
7. Acceptable Manufacturers.
   a. SciMatco
   b. Eagle
   c. Justrite
   d. Haz-Stor Company 847-294-1000

B. [EQ #2]: Pesticides Safety Storage Cabinet (located at Maintenance Building).
1. Outdoor storage unit, 6-drum capacity.
2. Chemical resistant epoxy finished with "Hazardous Materials" warning signs.
3. Complies with EPA, NFPA, and OSHA requirements.
4. Size:
   a. 66"L x 90"W x 96"H.
5. 2-door unit with integral spill containment.
6. Provide unit with 6-drum Dolly's – Rubbermaid #2650
7. Manufacturer: Eagle #17-985-76B
8. Acceptable Manufacturers.
   a. SciMatco
   b. Eagle
   c. Justrite

C. [ES.2]: Pressure Washer (located at Maintenance Building).
1. 3.0 gallon minimum variable to 3000psi.
2. 285,000 BTUs, oil fired, 12v DC automatic start.
3. Coil: ½" schedule 80, with stainless steel jacket.
4. Roll cage with mounted hose real.
   a. Hose:
      1) 50' x 3/8" (3000psi).
      2) Wire braided.
      3) Variable pressure wand.
      4) Stainless steel nozzles with brass quick disconnect.
5. 4-pneumatic wheels.
6. Chemical injection control (downstream).
7. Size: 47" x 26" x 41".
8. Manufacturer: Landa, Model #MVP4-30325E, with added accessories noted above.
9. Acceptable Manufacturers:
   a. Landa
   b. Ramteq
   c. Hotsy

D. [M.60]: Hose Reels (located in Maintenance Building).
1. Wall mounted and suspended as noted on drawings.
2. 5-reels per location.
   a. 1-grease.
   b. 2-power.
   c. 1-water.
   d. 1-air.
3. Grease reel.
   a. 1-overhead mounted grease reel.
   b. 1-wall mount grease reel.
   c. 50’ hose 3/8’ (4000psi).
   d. Graco Series 500, #224-054.
   e. Hose guide and grease gun.
4. Water reel.
   a. 1-overhead mounted water reel.
   b. 1-wall mounted water reel.
   c. Hose: 3/8” x 60’ ½” npt (180psi).
   d. Graco #224-051.
5. Air reel.
   a. 1-overhead mounted water reel.
   b. 1-wall mounted water reel.
   c. Hose: 3/8” x 60’ ½” npt (180psi).
   d. Graco #224-051.
6. Power reels.
   a. 2-overhead power cord reels, with light and plug 12 - Awq 50’, 110V – 20Amp.
   b. 2-wall mounted power cords with light and plug, 12 - Awq 50’, 110V – 20Amp.
   c. Reel Craft.
7. All reels shall be spring loaded/retractable type, heavy duty industrial use related.
8. Provide anchor bolts and steel support. Structure suspended from overhead rigid steel frame.
9. Provide ¼” x 3” x 3” vertical & horizontal steel angles, cross braced all sides and all 4-directions.
10. Provide ¼” steel mounting plate with steel angle support frame, fully welded construction.
11. Mount reels at 10’ above finish floor with hoses set at 7’ A.F.F.
12. Provide bolts with lock nuts and upset threads to prevent “back-off” of nuts and bolts.
13. Reel accessories.
   a. Provide quick disconnect fittings.
   b. Lincoln: nipple 11659 ¼” npt male; coupler 815.
   c. 64 series for 3/8” nipple and couplers.
   d. 65 series for ½” nipple and couplers.
14. Provide the following attachments.
   a. 846 water bibb (quantity: 2).
   b. 80423 tire inflator (quantity: 2).
   c. 81495 grease gun with whip hose (quantity: 2).
   d. 83595 swivel connector (quantity: 2).
   e. 85516 adjustable ball stop (quantity: 10-required).
15. Approved reel Manufacturers: comply with the above requirements select on of the following:
   a. Graco, Inc. 800-367-4023
   b. Hannay 518-797-3791
   c. Lincoln 314-679-4300
   d. Reel Craft

E. [M.61]: Grease system (located in Maintenance Building).
1. Grease system shall be installed including but not limited to the following features.
   a. Air operated pump with system Lincoln Model #918; pump, cover, follower, hoses, air, and fluid connectors.
   b. 5/8” high pressure tubing with fittings, .083”T: tubing 5000psi continuous duty rated.

c. ¼" npt regulator with oiler and filter #600204/82413/600104.
d. 5/8" high pressure shut off valve.
e. Extend air lines from nearest drop riser and tap to provide air to pump.
f. Provide flexible air hose to pump (minimum 6' long) with flexible high pressure hose (6000psi) to grease piping system.
g. Provide all couplings, T's, 90's, unions, swivel connections, and fittings for a complete system. Conform to approved system shop drawings.
h. Provide safety data and warning signs posted on equipment. Comply with OSHA standards.

F. [MS.51]: Electric Chain Hoist (located at Maintenance Building).
1. CM ValueStar stock #P72-938DV with trolley stock #P72-867D.
2. Beam height 14' AFF to bottom.
3. Beam shall be suspended using 6" x 6" x ¼" tube steel from centerline of rigid frame.
4. Plate at top and bottom shall be ½" Tall x 16" Long with 10 ¾" through bolts with nuts and washers at each rigid frame and top of beam connection point.
5. Load shall be 2-ton lift capacity with 3-ton connection capacity.
6. Hoist electrical power.
   a. 1 H.P. - 240V service.
   b. 25' flexible cord with spring supports for traveling hoist locations. (Power feed rail is acceptable option.)
7. Controls:
   a. Push button up and down.
   b. Pendant controls.
8. Acceptable Manufacturers:
   a. ACCO Chain & Lifting Products
   b. CM ValueStar
   c. Deshazo Crane Co. Inc.

G. [AD.32]: Gravesite Locator Kiosk Model 6 (located at Administration Building).
1. See NCA/OTS contract and additional amendments.
   a. See the following for literature/specifics.
      1) Office Technology Systems 303-456-0990
      10625 W. 1-70 Frontage Road N. Unit 1
      Wheat Ridge, CO 80033
   b. Provide stainless steel exterior finishes.
   c. Coordinate rough opening for stainless steel surround/jambs.
   d. Coordinate electrical service for 100V/20Amp service to side of unit.
   e. Coordinate final location of data/telephone jack locations and LAN.
   f. Provide 3-year free service & warranty support w/no additional cost to Owner/using Agency. Service shall include no less than quarterly system operating updates, functional testing and cleaning. Conform to Federal Contract requirements for 1-year of service for 2nd and 3rd year.
   g. Provide a fully functional Kiosk with all software and hardware to conform to the "BOSS" system.
   h. Provide minimum of 4-hours training after "substantial completion" to the using Agency staff. Training seminar shall be video taped and 1-copy furnished with the Maintenance Manuals (3-required) prior to project completion and closeout.
   i. Include all names, phone numbers, addresses, and information specific to this system and manufacturers' maintenance information.

H. [M.12]: Workbenches and Shelving
1. Work Benches – Model #'s
   a. Lyon Work Bench with Sky-Wal.
      1) 7 – Lyon 60"L x 28"D x 34"H #75528
      2) 1 – Lyon 72"L x 28"D x 34"H #75628
   b. Top pressed wood over steel.
      1) 1 ¾"T x 60" #2737
      2) 1 ¾"T x 72" #2739
   c. Wedgewood Blue upper unit.

1) 4-Drawer units #2788-4
2) 60” #79200
3) 72” #79202

d. Provide work light on all work benches and 2-adjustable shelves (Sky-Wal). Bolted to bench and walls.

2. Shelving System: Lyon Series 8000
   a. Steel Shelving Systems
   b. Closed sides and back
   c. 6-shelves/unit
   d.

SIZE	LOCATION	QTY
24”D x 84”H x 36”L	Tool and Parts Room, #8262 SWS	12
24”D x 84”H x 48”L	Parts Room, #8333 SWS	4
12”D x 84”H x 36”L	Parts Room, #8260 SGLV	7
Pidgeon Hole Unit: 36” x 9”D	#8192	3
Pidgeon Hole Unit: 36” x 18”D	#8191	3

3. Acceptable Manufacturers:
   a. Lyon
   b. Penco
   c. Borroughs
   d. EDSAL

I. [ES.3]: Bio Remediation Treatment System Reference E-03 of General Conditions for Substitution.
   1. Location: Maintenance Building, Wash Station
   2. Manufacturer: Water - MAZc
   3. Model: WS-1000
   4. Flowrate: 10 – 15 GPM
   5. Power Reg: 120V. – 20Amp
   6. Pump: ½ HP submersible
   7. Type: 3-Tanks
   8. Filter Area: Bio-Media - 500 SF
   9. Airation: 4.5 CFM
   10. Tank Size: 147”L x 72”W x 80”H
   11. Accessories:
      a. Pit cleaner #30-575
      b. Sludge cart #30-580
      c. Fiberglass sump pit/catch basin 3’ x 3’ x 4.5’ #30-717
      d. Active agent: Biostax 900
   12. Distributor: Marchman Chemical Products Co.
      PH: 800-521-4966, FX: 706-650-8785
   13. Warranty – 1-year parts and labor
   14. Install unit to conform to manufacturers installation diagrams.
      a. Provide all utility connections, piping, hoses, valves, wiring, controls, and fittings for a complete operational system.
      b. Provide trench drain, grit chamber and sump pump lift station.
      c. Provide electrical wiring, conduit and disconnects per Division 16 NEMA R3.

NOTE: Other manufacturers will be considered upon submittal and approval prior to Bid.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, service-utility connections, and other conditions affecting installation and performance of service equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine rough-in for piping, mechanical, and electrical systems to verify actual locations of connections before installation.

3.2 INSTALLATION, GENERAL

A. Install service equipment level and plumb, according to manufacturer's written instructions, original design, and referenced standards.

B. Indicate field joints and methods of connection on Drawings. Correlate with NSF 2 requirements. Complete equipment field assembly, where required, using methods indicated.
1. Provide closed butt and contact joints that do not require a filler.
2. Grind field welds on steel equipment supports smooth, and polish to match adjacent finish. Comply with welding requirements in "Fabrication, General" Article.

C. Install equipment with access and maintenance clearances according to manufacturer's written instructions and requirements of authorities having jurisdiction.

D. Provide equipment, service lines & make final connections.

E. Except for mobile and adjustable-leg equipment, securely anchor and attach items and accessories to walls, floors, structural steel, or bases with corrosive resistant steel fasteners, unless otherwise indicated.

F. Install equipment on concrete or masonry bases in a bed of sealant.

G. Install seismic restraints according to **current** IBC.

3.3 PROTECTING

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure service equipment is without damage or deterioration at the time of Architects Final Certification.

3.4 COMMISSIONING

A. Startup Services: Engage factory-authorized service representatives to perform startup services and to demonstrate and train Owner's maintenance personnel as specified below.
1. Remove protective coverings and clean equipment, both inside and out. Where applicable, comply with manufacturer's written cleaning instructions.
2. Test each equipment item for proper operation. Repair or replace equipment that is defective in operation, including units that operate below required capacity or that operate with excessive noise or vibration.
3. Test & adjust controls & safeties. Replace damaged and malfunctioning controls and equipment.
4. Test motors and rotating equipment for proper rotation and lubricate moving parts according to manufacturer's written instructions.

3.5 TRAINING

A. Provide 4 hours on site staff training. Record seminar and edit on site. Provide recorded documentation and software program for computer/projector play-back.

END OF SECTION

DIVISION 11 – EQUIPMENT
SECTION 11 80 00 - CARILLON

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes Carillon equipment indicated on Drawings and schedules.

B. This Section includes fabrication, handling, delivery to the site, storage and installation of Carillon. Includes associated foundation, design, placement of the unit:
1. The steel reinforcement, steel embedment plates, required sleeves, fasteners, anchor bolts, concrete footing (pads) and installation.

C. The design of Carillon shall be shall be as described in this Section. Installation layout shall be as illustrated on the drawings. All designs will require that the manufacturer provide fabrication drawings stamped by a Professional Engineer licensed in the State of Georgia indicating that the design meets or exceeds the structural requirements contained herein. The Contractor may propose alternative designs of the corresponding components if all of the following requirements are met:
1. Reference Article E-03 of General Conditions for Substitution requirements.
2. Any proposed alternative design will comply with design criteria of this specification.
3. All provisions of this specification shall apply to any proposed alternative design.
4. The Owner may accept or reject part or all of any proposed alternative design. The cost of design will be paid for by the Contractor.

D. Related Sections include the following:
1. Section 03 30 00 “Cast-In-Place Concrete”.
2. Section 05 50 00 "Metal Fabrications" for equipment supports.
3. Refer to Division 26 Sections for connections to wiring, disconnects, and other electrical materials required to complete Carillon equipment installation.

1.2 SUBMITTALS

A. Product Data: For each type of Carillon equipment indicated. Include manufacturer's model number and accessories and requirements for access and maintenance clearances, water and drainage, power and service-connections including roughing-in dimensions.

B. Shop Drawings: For Carillon equipment not manufactured as standard production and catalog items by manufacturers. Include plans, elevations, sections, roughing-in dimensions, fabrication details, service requirements, and attachments to other work.
1. Wiring Diagrams: Details of wiring for power, & control systems & differentiating between manufacturer-installed and field-installed wiring.
2. Piping Diagrams: Details of piping systems and differentiating between manufacturer-installed and field-installed piping.
3. Foundation:
   a. Provide design calculations for Carillon anchor bolts and foundation requirements per **current** IBC.
   b. Provide layout drawings and templates for anchor.
   c. Provide steel reinforcing schedules and material certificates.

C. Coordination Drawings: For locations of Carillon equipment service utilities. Essential equipment with item numbers & descriptions indicated in Contract Documents. Include plans & elevations of equipment, access-/maintenance-clearance requirements, details of concrete foundations and service-utility characteristics. Show all piping, fittings, and utilities.

D. Samples for Initial Selection: Manufacturer’s color charts showing the full range of colors available for exposed products with color finishes: “Dark Bronze” per using Agency Standards.

E. Maintenance Data: Operation, maintenance, & parts data for service equipment to include in maintenance manuals specified in Division 1. Include a product schedule as follows:
1. Product Schedule: For each equipment item, include item number & description indicated in Contract Documents, manufacturer's name and model number, and authorized service agencies' addresses and telephone numbers.

F. Provide Welding certifications for steel fabrications.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide Carillon and connections capable of withstanding design loads within limits and under conditions indicated.

B. Design under supervision of professional engineer licensed in the State of Georgia with all Engineering submittals stamped, sealed and signed.

C. Design Loads:
1. Applicable Building Code: Georgia Adopted Standard Building Code, **current** IBC.
2. Roof Wind Load: Calculate in accordance with applicable code, using 110 mph Basic Wind Speed, Exposure Category per **current** IBC, and Internal Coefficient, GCpi= 0.18.
3. Seismic Loads: Calculate in accordance w/applicable code, for State of Georgia, Occupancy Group Business.
   a. Seismic Hazard Exposure Group: II.
   b. Seismic Performance Category: C.
   c. Site Class D; Sds=0.28; Sd1=0.15.
5. Dead Loads, including the weight of all indicated permanent construction.

D. Anchor Bolts: Furnish design criteria and anchor bolts to resist the loads induced by the design loads on the Carillon structure.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing Carillon equipment, who has completed installations similar in design and extent to that indicated for this Project, and who has a record of successful in-service performance.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing service equipment similar to that indicated for this Project and with a record of successful in-service performance.

C. Source Limitations: Obtain each type of service equipment through one source from a single manufacturer.

D. Product Options: Drawings indicate Carillon equipment based on specific products indicated. Other manufacturers' equipment w/equal size & performance characteristics may be considered. Refer to Division 1 Section E-03. General conditions for substitutions and prior approval submittal requirements.

E. Regulatory Requirements: Comply w/the following National Fire Protection Association (NFPA) codes:
1. NFPA 70, "National Electrical Code" **current** edition with GA Amendments.

F. Listing and Labeling: Provide electrically operated equipment or components specified in this Section that are listed and labeled.
1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

G. Seismic Restraint: Provide seismic restraint for Carillon equipment.

H. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to equipment including, but not limited to, the following:
1. Review access requirements for equipment delivery.
2. Review equipment storage and security requirements.
3. Inspect and discuss condition of foundation and other preparatory work performed by other trades.
4. Review structural loading limitations.
5. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver Carillon equipment as factory-assembled units with protective crating and covering.

B. Store Carillon equipment in original protective crating and covering and in a dry location.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of service equipment installation areas by field measurements before equipment fabrication and indicate measurements on Shop Drawings and Coordination Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 COORDINATION

A. Coordinate equipment layout and installation with other work, including electrical service and communications conduits.

B. Coordinate location and requirements of service-utility connections.

C. Coordinate size, location, and requirements of structural supports and concrete bases. Concrete, reinforcement, and formwork requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."

D. Coordinate installation of equipment supports, and reinforcing.

1.8 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents & shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Warranty Period: 1 year from date of Architects Final Certificate, including “Maintenance Service” required for equipment and systems specified.

PART 2 - PRODUCTS

2.1 CARILLON EQUIPMENT SCHEDULE

A. Carillon Amplifier Cabinets:
1. Requirements: 120 VAC/60Hz/20 Amps. Location:
   a. Committal Shelter, Electrical Room.
2. Manufacturer: Schulmerich – The Verdin Company.
3. Model: Memorial Bells, Symphony.
4. Features:
   a. Provide 15” angled color touch screen.
   b. Provide:
      1) Rifle Volley and Taps.
      2) Funeral Toll.

3) Westminster and Hour Strike.
4) AutoBell Sequencer.

c. Provide 6-horns #13-167.
1) (4) In Carillon tower.
2) (2) Pedestal mounted – Committal Shelter (Exterior).

d. Provide speaker wire.
1) 200’ Committal Shelter (2x100’)
2) 700’ to Carillon (8 Conductor to 4 towers horns).

e. Provide one (1) remote control unit with one (1) antenna.

f. Warranty:
1) Manufacturer’s published warranty.
2) 1-year all parts and labor.
3) 3-years all parts.
4) 5-years drivers and horns.

5. Products and manufacturers will be considered based upon prior approval in accordance with the E-03 General Conditions, substitutions and on-site demonstration and approval by the Architect, Owner & Using Agency.

B. Carillon Tower:

1. Veterans Tribute Standard Carillon Towers: 45’
a. Pre-engineered and pre-fabricated steel, 4 Post, 6”x6” structure. Conform to drawings. Pre-finished “Dark Bronze” enamel finish.
b. Bell Shells: Pre-finished fiberglass, sizes as noted on drawings.
c. Internal wiring raceway for speaker wiring from base to speaker enclosure.
d. Foundation anchorage designed for field installed anchor bolts.
e. Speaker Enclosure: Pre-finished metal grille, rectangular sides (4) with square plan configuration.

2. Substitute Products will be considered based upon prior approval in accordance with 01 60 00 “Product Requirements” and approval by the Architect, Owner and using Agency.

3. Fabrication: All welding shall be performed by Certified Welders qualified in accordance with AW S D1.1 Structural Welding Code - - Steel and AWS D1.3 Structural Welding Code sheet steel.

4. Accessories:
a. Internal conduit and boxes: Rigid conduit per Division 26 NEMA R3 for exterior use.
b. Anchor bolts: Engineered for Carillon structure per **current** IBC.
c. Provide speaker mounting brackets in tower and for ground pedestal mounting.

5. Metal Materials:
a. Select materials and material yield strengths based on building design requirements; use the following unless required otherwise.
1) Structural Steel Plate, Bar, Sheet, & Strip for Use in Bolted & Welded Constructions: ASTM A 572/A 572M, A 529/A 529M or A 36/A 36M Modified 50, w/minimum yield strength of 50,000 psi (345 MPa).
2) Structural Steel Material for Use in Roll Formed or Press Broken Secondary Structural Members: ASTM A 570/A 570M, with minimum yield strength of 55,000 psi (380 MPa).

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, service-utility connections, and other conditions affecting installation and performance of service equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine rough-in for electrical systems to verify actual locations of connections before installation.

3.2 INSTALLATION, GENERAL

A. Install Carillon equipment level and plumb, according to manufacturer's written instructions, original design, and referenced standards.

B. Indicate field joints and methods of connection on Drawings. Correlate with NSF 2 requirements. Complete equipment field assembly, using methods indicated.
   1. Provide closed butt and contact joints that do not require filler.
   2. Grind field welds on steel equipment supports smooth, and polish to match adjacent finish. Comply with welding requirements in "Fabrication, General" Article.

C. Install equipment with access and maintenance clearances according to manufacturer's written instructions and requirements of the work.

D. Provide equipment, service lines & make final connections.

E. Except for mobile and adjustable-leg equipment, securely anchor and attach items and accessories to walls, floors, structural steel, or bases with corrosive resistant fasteners, unless otherwise indicated.

F. Install equipment on concrete bases in a bed of sealant.

G. Install seismic restraint according to **current** IBC.

3.3 PROTECTING

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Architect that ensure equipment is without damage or deterioration at the time of Architects Final Certification.

3.4 START UP

A. Startup Services: Engage factory-authorized service representatives to perform startup services and to demonstrate and train Owner's maintenance personnel as specified below.
   1. Remove protective coverings and clean equipment, both inside and out. Where applicable, comply with manufacturer's written cleaning instructions.
   2. Test each equipment item for proper operation. Repair or replace equipment that is defective in operation, including units that operate below required capacity or that operate with excessive noise or vibration.
   3. Test & adjust controls. Replace damaged and malfunctioning controls and equipment.

3.5 TRAINING

A. Provide 4 hours on-site staff training. Record seminar and edit on site. Provide recorded documentation and software program for computer/projector play-back.

END OF SECTION

DIVISION 12 - FURNISHINGS
SECTION 12 49 21 – HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interior Window Blinds:
   1. 2” Horizontal Louver Blinds with Faux Slats.
   2. Installation accessories and hardware.

1.2 SUBMITTALS

A. Submit under provisions of Section 01 33 00 “Submittals”.

B. Product Data: Provide manufacturer's standard details and catalog data demonstrating compliance with project requirements. Provide installation instructions.

C. Shop Drawings: Submit shop drawings illustrating component details and relationship to other construction.

D. Samples: Submit samples of each type of finish. Color selected by Owner/Architect.

1.3 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Trained and experienced in the proper installation of the panels specified, with no less than 3 years' experience.

1.4 DELIVERY, STORAGE, AND HANDLING OF PRODUCTS

A. Protect materials from weather elements and handling damage from origin points to delivery to the job site. Store materials in an enclosed, clean, and dry area.

1.5 WARRANTY

A. Material and workmanship in conjunction with installations shall be warranted against defects for 1 year after installation. The warranty shall cover defects and workmanship when handled and installed in accordance with manufacturer's specifications and procedures.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Provide products meeting the specified requirements from one of the following:
   1. Sunburst Shutter & Window Fashion.
   2. See Section 01 60 00 Product Requirements for substitution request and BABAA compliance procedures.

2.2 MATERIALS

A. Single Headrail.

B. Bottomrail - shall be “C” shaped, 0.040" thick anodized aluminum with polywood casing.

C. Slats:
   1. Moisture-resistant, solid extruded polywood material.

D. Tilter - shall be a worm and gear design in a fully enclosed gear case housing. Design shall

incorporate a clutch mechanism to eliminate damage due to over-tilting. Operator shall be on left-hand side of units. Provide a crash-proof locking mechanism. Remote operation.

E. Cord Lock - shall be a snap-in design with stainless steel wear guard and a floating locking pin and shall be crash proof.

F. Tiltrod - shall be electro-zinc coated solid steel, 0.155-inch square in cross section. Extend to 4'-0" above finish floor.

G. Tiltrod Support - shall be low friction thermoplastic and will support tiltrod. Tiltrod support will position ladder drums and guide cords and ladders without abrasion.

H. Ladder Drums - shall be low friction thermoplastic with smooth hole edges to position ladders.

I. Ladder - shall be made of braided polyester yarn.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect window casings for acceptable installation conditions. Report unsuitable conditions and begin installation after conditions are acceptable.

B. Verify actual opening dimensions by job site measurements.

3.2 INSTALLATION

A. Install aluminum louver blinds on all new interior and exterior windows. Install all components in accordance with manufacturer's instructions.

B. Provide and install all fasteners required for a complete and secure blind installation. Fasteners shall be concealed.

C. Size blinds to fit window opening and operate without binding and provide complete window coverage.

3.3 CLEANING AND PROTECTION

A. Clean soil, stains, etc. from surfaces. Clean and polish glass. Remove excess materials and dispose.

END OF SECTION

DIVISION 13 – SPECIALTY CONSTRUCTION
SECTION 13 34 19 – METAL BUILDING SYSTEMS

PART 1 – GENERAL

1.1 METAL BUILDING SYSTEM COMPONENTS

A. Clear span rigid frame

B. 11’6” minimum clearance at knee.
8” inch depth straight exterior columns.

C. Bay spacing as shown on drawings.

D. Roof Slope: As shown on Drawings.

E. Primary Framing: Rigid frame of rafter beams and columns, canopy beams.

F. Secondary Framing: Eave struts, wind beams, and other items detailed.

G. Lateral Bracing: Horizontal loads not resisted by main frame action shall be resisted by cable and/or portal frames. Cable rod in the roof.

H. Wall and Roof System: Preformed steel panels insulation and accessory components.

1.2 RELATED SECTIONS

A. Section 03 30 00 “Cast In Place Concrete”: Concrete footings and floor slab.

B. Section 07 41 10 “Standing Seam Metal Roofing: Metal roofing

C. Section 07 92 00 “Joint Sealants & Gasketing”: Joint sealers

D. Section 09 91 00 “Painting”: Finish painting of gypsum board assemblies.

1.3 REFERENCES

A. AISI S100, *North American Specification for the Design of Cold-Formed Steel Structural Members,* Washington, DC, 2016

B. AISC 360, *Specification for Structural Steel Buildings,* American Institute of Steel Construction, Chicago, IL 2016.

C. ASTM A36-14, *Standard Specification for Carbon Structural Steel*, West Conshohocken, PA.

D. ASTM A307-14e1, *Standard Specification for Carbon Steel Bolts, Studs and Threaded Rod 60,000 psi Tensile Strength*, West Conshohocken, PA.

E. ASTM A463-15, *Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process*, West Conshohocken, PA.

F. ASTM A653-17, *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*, West Conshohocken, PA.

G. ASTM A792-10(2015), *Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process*, West Conshohocken, PA.

H. ASTM A1011-14, *Standard Specification for Steel, Sheet and Strip, Hot Rolled, Carbon, Structural, High Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, and*

Ultra-High Strength West Conshohocken, PA.

I. AWS A2.4, *Standard Symbols for Welding Brazing, and Nondestructive Examination*, Miami, FL, 1998.

J. AWS D1.1, *Structural Welding Code - Steel*, Miami, FL, 2015.

K. AWS D1.3, *Structural Welding Code - Sheet Steel*, Miami, FL, 2008.

L. MBMA, *Metal Building Systems Manual*, Metal Building Manufacturers Association, Cleveland, OH, 2018.

M. SSPC, (The Coatings Society) - SP2 - *Specification for Hand Tool Cleaning*, 2004 (Part of Steel Structures Painting Manual, Vol. Two)

N. SSPC, - Paint 15 - *Steel Joist Shop Primer/Metal Building Primer*; ; 2004 (Part of Steel Structures Painting Manual, Vol. Two)

O. SSPC, - Paint 20 - *Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic)*; Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).

1.4 DESIGN REQUIREMENTS

A. The building shall be designed by the Manufacturer as a complete system. All components of the system shall be supplied or specified by the same manufacturer.

B. Design Code: Design shall be in accordance with **current** IBC.

C. Energy Code: **current** IECC with GA Amendments.

D. Risk Category: II

E. Dead Loads: The dead load shall be the weight of the Metal Building System and as determined by the system manufacturer.

F. Collateral Loads: The collateral load shall be 5 psf or as shown on the contract drawings. Collateral Loads shall not be applied to the roof panels.

G. Live Loads: The building system shall be capable of supporting a minimum uniform live load of 20 psf.

H. Snow Loads: The design ground snow loads shall be 10 psf or as defined on the contract drawings.

I. Wind Loads: The basic design wind speed for the metal building system shall be 110 mph or as defined on the contract documents.

J. Seismic Loads: Seismic load shall be determined based upon a spectral response acceleration factors:
   a. S_{ds}= 0.28 and S_{di} = 0.15

K. Rainfall Intensity:
   a. All exterior gutters and downspouts shall be designed for rainfall intensity based upon a 5-year recurrence interval for a five-minute duration. All interior gutters, valleys and downspouts shall be designed for rainfall intensity based upon a 25-year recurrence interval based on a five-minute duration.

L. Deflection and drift requirements shall be in accordance with the applicable recommendations of the AISC *Steel Design Guide Series 3 - Serviceability Design Considerations for Steel Buildings*.

M. Thermal Effects: Standing Seam roof panels shall be free to move in response to the expansion and contraction forces resulting from a temperature variation. Assembly to permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, according to manufacturer's recommended temperature range.

N. Site Conditions: The following site features and adjacent structures must be considered in the design.
   a. Building cantilevers over an existing structure and shall not use the existing structure for support.

1.5 SUBMITTALS

Note: All manufacturer's drawings and design calculations shall bear the professional seal and signature of a licensed professional engineer registered in the state of GA.

A. Submit anchor rod placement plan, column reactions, in advance of erection drawings.

B. Product Data: Provide data on component dimensions and color selection.

C. Manufacturer's Installation Instructions: Indicate preparation requirements, assembly sequence, and schedule.

D. Shop or Erection Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, openings, cambers, and loads and; column layout, general construction details, anchorages and method of anchorage, installation and; framing anchor rod settings, sizes, and locations from datum, and foundation loads; indicate field welded connections with AWS A2.4 welding symbols; indicate net weld lengths.

1.6 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with MBMA *Metal Building Systems Manual*, and, for items not covered, AISC - *Specification for Structural Steel Buildings.*

1.7 QUALIFICATIONS

A. Manufacturers must comply with BABAA requirements and supply Letter of Certification in Submittals.

B. Manufacturer: The company manufacturing the products specified in this Section shall have a minimum of 5 years experience in the manufacture of metal building systems. The metal building systems manufacturer shall be accredited under the International Accreditation Service, *Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems (AC472)*.

C. Structural framing and covering shall be the design of a Registered Professional Engineer experienced in design of this work.

D. Erector shall be accredited under the International Accreditation Service, *Accreditation Criteria for Inspection Practices of Metal Building Assemblers (AC478)*]

1.8 FIELD MEASUREMENTS

A. Metal building contractor shall verify that field measurements are as indicated in contract.

1.9 WARRANTY

A. Building manufacturer shall provide manufacturer's standard material warranty.

B. Metal building contractor shall provide a workmanship warranty of 1 year from date of completion.

1.10 ADMINISTRATION

A. All nomenclature shall conform to the MBMA *Metal Building Systems Manual*.

B. Coordination and administration of the work shall be in accordance with the MBMA *Metal Building Systems Manual - Chapter IV Common Industry Practices*.

SECTION 2 – PRODUCTS

2.1 MATERIALS - ROOF SYSTEM

A. Standing Seam Roofing: See Section 07 41 10 “Standing Seam Metal Roofing”.

2.2 FABRICATION - PRIMARY FRAMING

A. Framing Members: Clean and prepare in accordance with SSPC-SP2 as a minimum, and coat with building manufacturer's standard primer. Note: Galvanizing may require further preparation.

B. Hot rolled members shall be fabricated in accordance with AISC Specification for pipe, tube, and rolled structural shapes.

C. Fabricate built-up members in accordance with MBMA *Metal Building Systems Manual, Chapter IV Common Industry Practices*.

2.3 FABRICATION – SECONDARY

A. Framing Members: Clean and prepare in accordance with SSPC-SP2, as a minimum, and coat with building manufacturer's standard primer. Note: Galvanizing may require further preparation.

B. Cold-Formed Members: Cold-formed structural shapes shall be fabricated in accordance with MBMA *Metal Building Systems Manual, Chapter IV Common Industry Practices*.

SECTION 3 – EXECUTION

3.1 EXECUTION

A. Verify site conditions under provisions of Section 02 41 10 “Demolition & Site Clearing”.

B. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position and properly squared.

C. Provide access to the work as scheduled for owner provided inspections, if required. The cost of any required inspections is the responsibility of the owner.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 ERECTION – FRAMING

A. Erect framing in accordance with MBMA *Metal Building Systems Manual, Chapter IV Common Industry Practices*.

B. Use templates for accurate setting of anchor rods. When required, level bearing plate area with steel wedges, shims or grout. Check all previously placed anchorages.

C. Erect building frame true and level with vertical members plumb and bracing properly installed. Maintain structural stability of frame during erection.

D. Ream holes requiring enlargement to admit bolts. Burned holes for bolted connections are not permitted without written approval by designer. Burned holes to be reamed.

E. Tighten bolts and nuts in accordance with RCSC *Specification for Structural Joints Using High-Strength Bolts*, using specified procedure. Turn of nut tightening, tension control bolts, or direct tension indicator washwers may be used to assure correct tightening.

F. The erector shall furnish temporary guys and bracing where needed for squaring, plumbing, and securing the structural framing against loads, such as wind loads acting on the exposed framing and seismic forces, as well as loads due to erection and erection operation, but not including loads resulting from the performance of work by others. Bracing furnished by the manufacturer for the metal building system cannot be assumed to be adequate during erection and are not to be used to pull frames into plumb condition.

The temporary guys, braces, falseworks and cribbing are the property of the erector, and the erector shall remove them immediately upon completion of erection.

G. Do not field cut or modify structural members without approval of the metal building manufacturer.

H. After erection, erector to prime welds, abrasions, and surfaces not shop primed or needing touch-up.

3.7 TOLERANCES

A. All work shall be performed by experienced workmen in a workmanlike manner to published tolerances.

B. Install framing in accordance with MBMA *Metal Building Systems Manual, Chapter IV Common Industry Practices*.

DIVISION 22 - PLUMBING
SECTION 22 00 00 - GENERAL PLUMBING PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes general provisions covering the contract documents for Plumbing Systems.

1.3 DEFINITIONS

A. Provide shall mean "Furnish, install and connect."

B. Piping shall mean "pipe installed with all specified fittings, valves and accessories, and forming a complete system."

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Electrical Coordination: In addition to submittal requirements of other Division 22 Sections, submit a document approved by the project Electrical Contractor certifying that all mechanical equipment being furnished under Division 22 complies with the electrical characteristics of the source power which will be furnished under Divisions 26 and 27.

C. Model numbers listed on the Mechanical Contract Documents shall not be construed to indicate electrical characteristics. Electrical characteristics of mechanical equipment shall be as indicated on the Electrical Contract Documents (Division 26).

D. Review of Submittals does not relieve the Contractor of any of the requirements of the Contract Documents. Failure by the Engineer to document errors and omissions in the Contractor's submittals during the Engineer's submittal review does not constitute a waiver of any of the requirements of the original sealed Contract Documents.

1.5 CONTRACTOR QUALIFICATIONS

A. Plumbing Subcontractor shall have a Class II Unlimited License and shall have demonstrated proficiency in the installation of plumbing systems by the successful installation of systems similar to those included in the Construction Documents for this project. Such systems shall have been installed in commercial or institutional buildings having a minimum of 150 plumbing fixtures (in a single building). The Subcontractor shall have been in business as described above for a minimum period of five years.

B. A master or journeyman plumber shall be present at the site during the installation of all plumbing related work. The master or journeyman plumber shall be certified in the state in which the construction is being performed and shall have his license present at site or on file during construction.

1.6 LAYOUT AND COORDINATION

A. Layout Basis:

1. The equipment listed on the Drawings and in the Specifications has been used for the physical arrangement of the mechanical systems. When equipment listed as acceptable, equal or equipment which has received "prior approval" is used, it shall be the Contractor's responsibility to provide structural, ductwork, electrical, service clearances, or other changes required to accommodate the substituted equipment. Changes shall be made at no additional cost to the Owner. Submit a list of required changes along with all prior approval requests and shop drawing submittals.
2. The Contract Drawings are intended to show the general arrangement of all mechanical work. They do not show in detail all offsets, fittings and transitions. Examine Drawings, investigate site conditions to be encountered and arrange work accordingly. Furnish all offsets and transitions required.
3. Drawings do not indicate in detail exact configuration of connections for fixtures, equipment and accessories. Final connection shall be as shown on approved Manufacturer's Submittal Drawings. Where Manufacturer's Submittal Drawings conflict with the Contract Documents, confer with the Design Professional for resolution.
4. Measurement of Drawings by scale shall not be used as dimensions for fabrication. Measurements for locating fixtures, equipment, ductwork, piping and other mechanical items shall be made on the site and shall be based on actual job conditions.
5. Check space limitations and verify electrical requirements before ordering any mechanical equipment or materials. Place large equipment inside the building prior to the erection of exterior walls where equipment cannot enter finished building openings.

B. Coordination: Mechanical work shall be coordinated with that of other trades to avoid conflict. The Contractor shall study all plans and specifications for this project and shall notify the Design Professional of any conflict between work under Division 22 and work under other divisions of the Project. Particular attention shall be given to interference between piping, electrical installations, structural systems, building openings and ductwork.

C. Installation Instructions: Manufacturer's installation instructions for all equipment furnished under Division 22 shall be furnished by the Contractor. Instructions shall be maintained on the jobsite until the project is complete and then turned over to the Owner.

1.7 PERMITS

A. Obtain all necessary Permits and Inspections required for the installation of this work and pay all charges incident thereto. Deliver to the Design Professional all certificates of inspection issued by authorities having jurisdiction.

B. Sewer tap fees, water tap fees, meter fees, Dept. of Labor Fees for Boilers and Pressure Vessels and all other charges for work under Division 22, including charges for utilities shall be paid by the Contractor.

1.8 SAFETY

A. OSHA Requirements applicable to the project shall be complied with at all times.

B. Manufacturer's Safety Instructions shall be followed in all instances.

C. Asbestos Containing Materials (ACM) shall not be used on this project.

D. Refrigerants containing CFC’s or HCFC’s shall not be used on this project, nor shall any equipment using such refrigerants be incorporated into this project.

E. Electrical Equipment Clearances: Piping, equipment and other mechanical installations shall not be located within 42" of the front or 36" of the side of any electrical switchboards, panelboards, power panels, motor control centers, electrical transformers or similar electrical equipment. Piping and ductwork shall not pass through or above electrical equipment rooms except as required to serve those rooms.

1.9 PROTECTION OF PLUMBING SYSTEMS DURING CONSTRUCTION

A. Material storage:
   1. All materials and equipment stored on the jobsite shall be elevated above the ground and stored under suitable weather cover. Materials and equipment shall not be situated in areas subjected to localized flooding.
   2. Manufacturer's original shipping packaging and protective coverings shall be left in place until the equipment is prepared for installation.

B. Roof protection: All penetrations through roofs, including roof vents and roof drainage system elements shall be properly protected during construction to prevent water intrusion into the building. Protective measures could include temporary covers and plugs, as well as other appropriate temporary elements.

C. Electrical enclosure protection:
   1. During construction, all protective covers and other devices shall be left in place that protect against inadvertent contact with live electrical circuits.
   2. All warning labels related to electrical and rotating equipment hazards shall be in place prior to energizing mechanical equipment circuits.

D. Protection of equipment and piping:
   1. Maintain temporary closures on the ends of all equipment and pipes as the installation work progresses. Temporary closures include plastic sheeting, tape and appropriate caps and covers.
   2. Where debris enters piping during installation, steps shall be taken to clean the interior of the pipe prior to placing in service.
   3. Where debris enters equipment during installation the duct interior shall be cleaned prior to placing in service.

1.10 CODES AND STANDARDS

A. Mechanical installations shall conform to the current edition (recognized by the State) of the following, in addition to any previously mentioned Codes and Standards.
   1. The International Building Code.
   2. The International Mechanical Code.
   3. The International Plumbing Code.
   4. The International Fire Protection Code.
   5. The State Energy Code.
   6. NFPA Standard 70, National Electric Code.
   7. NFPA Standard 101, Code for Safety to Life for Fire in Buildings and Structures.

1.11 OPERATION AND MAINTENANCE (O&M) MANUALS

A. Provide an electronic (PDF format) document containing all of the operation and maintenance manuals for mechanical equipment utilized on the project as specified in this and other sections of the specifications.
B. The O&M document shall include a cover page indicating the project name, project number, lead design professional, mechanical design professional, and project owner.
C. The document shall include a table of contents with electronic tabs that link to each of the equipment sections in the document.
D. Project-specific model and serial number information shall be shown on the lead page of each equipment section in the manual.
E. The manual shall include documentation confirming registration of extended warranties with the equipment manufacturer. This documentation shall include equipment serial numbers and dates of warranty start.
F. The document shall be submitted to the owner and the design team at least 15 days prior to the scheduled systems/equipment maintenance training.

1.12 OPERATION AND MAINTENANCE OWNER TRAINING

A. Training of the owner's designated maintenance personnel shall be scheduled with the owner in advance.
B. The content of the training session or sessions shall cover essential operating and maintenance characteristics of all mechanical equipment installed under the project.
C. Upon completion of the training, the owner and design team shall be presented with a document indicating the date and location of the training, the general description of the training, and a list of the owner's staff that attended the training.

PART 2 - PRODUCTS Not required for this section.

PART 3 - EXECUTION Not required for this section.

END OF SECTION 22 00 00

DIVISION 22 - PLUMBING
SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

A. This Section includes the following basic mechanical materials and methods to complement other Division 22 sections.
   1. Piping materials and installation instructions common to most piping systems.
   2. Concrete equipment base construction requirements.
   3. Equipment nameplate data requirements.
   4. Field-fabricated metal and wood equipment supports.
   5. Installation requirements common to equipment specification Sections.
   6. Cutting and patching.
   7. Touchup painting and finishing.

B. Pipe and pipe fitting materials are specified in piping system Sections.

1.3 DEFINITIONS

A. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.

B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

F. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Shop drawings detailing fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

C. Coordination drawings for access panel and door locations.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

A. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code--Steel."

B. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."
   1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."
   2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.

C. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

D. Coordinate all electrical service requirements for mechanical equipment prior to the submittal of shop drawings. Confirm the compatibility of all power services with the equipment being furnished. Confirm compatibility of electrical lugs being provided by the equipment manufacturer with the power wiring being furnished under Division 26. Furnish written documentation that all characteristics have been coordinated with and confirmed by the electrical subcontractor.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Protect stored plastic pipes from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

E. Coordinate connection of electrical services.

F. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

G. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces.

H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Refer to individual piping system specification Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual piping system specification Sections in Division 22 for special joining materials not listed below.

B. Pipe Flange Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents.
1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch minimum thickness, except where thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125 cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250 cast-iron and steel flanges.
2. ASME B16.20 for grooved, ring-joint, steel flanges.
3. AWWA C110, rubber, flat face, 1/8-inch thick, except where other thickness is indicated; and full-face or ring type, except where type is indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, except where other material is indicated.

D. Solder Filler Metal: ASTM B 32.
1. Alloy Sn95 or Alloy Sn94: Tin (approximately 95 percent) and silver (approximately 5 percent), having 0.10 percent lead content.

E. Brazing Filler Metals: AWS A5.8.
1. BCuP Series: Copper-phosphorus alloys.
2. BAg1: Silver alloy.

F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements: Manufacturer's standard solvents complying with the following:
1. Acrylonitrile-Butadiene-Styrene (ABS): ASTM D 2235.
2. Poly (Vinyl Chloride) (PVC): ASTM D 2564.
3. PVC to ABS Transition: Made to requirements of ASTM D 3138, color other than orange.

H. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.

2.3 PIPING SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type where required to conceal protruding fittings and sleeves.
1. Inside Diameter: Closely fit around pipe, tube, and insulation.
2. Outside Diameter: Completely cover opening.
3. Cast Brass: One-piece, with set-screw with polished chrome plate finish.

B. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
   A. Steel Sheet-Metal: 24-gage or heavier galvanized sheet metal, round tube closed with welded longitudinal joint.
   B. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
   C. Cast-Iron: Cast or fabricated wall pipe equivalent to ductile-iron pressure pipe, having plain ends and integral water stop, except where other features are specified.

2.4 FIRE-STOPPING

A. Fire-Resistant Sealant: Provide UL Listed firestopping system for filling openings around penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

B. Products: Subject to compliance with requirements, provide products by one of the following:
   1. Specified Technologies, Inc.
   2. 3M Corporation
   3. Metacaulk.
   4. Hilti, Inc.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS--COMMON REQUIREMENTS

A. General: Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 22 specify piping installation requirements unique to the piping system.

B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.

C. Install piping at indicated slope.

D. Install components having pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's printed instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, suspended ceilings, cabinet interiors and other exposed locations, according to the following:
1. Piping: Cast-brass, one-piece, with set-screw, and polished chrome-plated finish.

N. Install sleeves for pipes passing through concrete and masonry walls, concrete floor and roof slabs, exterior walls and where indicated.
1. Cut sleeves to length for mounting flush with both surfaces.
a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring where specified.
2. Build sleeves into new walls and slabs as work progresses.
3. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
a. Steel Pipe Sleeves: For pipes smaller than 6 inches.
b. Steel Sheet-Metal Sleeves: For pipes 6 inches and larger that penetrate gypsum-board partitions.
c. Cast-Iron Sleeve Fittings: For floors having membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
1) Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.
4. Except for below-grade wall penetrations, seal annular space between sleeve and pipe or pipe insulation in non-rated floors and partitions, using elastomeric joint sealants. EXCEPTION: Fire rated partition penetrations shall be sealed with U.L. Listed firestopping systems.

O. Above Grade, Exterior Wall, Pipe Penetrations: Seal penetrations using sleeves and elastomeric sealant. Size sleeve for ½-inch annular clear space between pipe and sleeve for installation of sealant.
1. Install steel pipe for sleeves smaller than 6 inches.
2. Install sheet metal sleeve assembly for sleeves 6 inches and larger.
3. Install cast iron sleeves according to manufacturer’s preprinted instructions.

P. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with U.L. Listed firestopping sealant system.

Q. Verify final equipment locations for roughing in.

R. Refer to equipment specifications in other Sections for roughing-in requirements.

S. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system Sections.
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

3. Soldered Joints: Construct joints according to AWS "Soldering Manual," Chapter 22 "The Soldering of Pipe and Tube."
4. Brazed Joints: Construct joints according to AWS "Brazing Manual" in the "Pipe and Tube" chapter.
5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full inside diameter.
6. Welded Joints: Construct joints according to AWS D10.12 "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe" using qualified processes and welding operators according to the "Quality Assurance" Article.
7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

8. Plastic Pipe and Fitting Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following standards:
   a. Comply with ASTM F 402 for safe handling of solvent-cement and primers.
   b. Acrylonitrile-Butadiene-Styrene (ABS): ASTM D 2235 and ASTM D 2661.
   c. Poly (Vinyl Chloride) (PVC) Non-Pressure Application: ASTM D 2855.
   d. PVC to ABS (Non-Pressure) Transition: Procedure and solvent cement described in ASTM D 3138.

T. Piping Connections: Except as otherwise indicated, make piping connections as specified below.
1. Install unions in piping 2 inches and smaller adjacent to each valve and at final connection to each piece of equipment having a 2-inch or smaller threaded pipe connection.
2. Install flanges in piping 2-1/2 inches and larger adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
3. Install dielectric unions and flanges to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION--COMMON REQUIREMENTS

A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Design Professional.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.

D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

E. Install equipment giving right-of-way to piping systems installed at a required slope.

3.3 PAINTING AND FINISHING

A. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

B. Paint all exposed steel surfaces of piping and supports with one coat of primer and two coats of enamel.

3.4 CONCRETE BASES

A. Construct concrete equipment bases of dimensions indicated, but not less than 4 inches larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive strength concrete with 6 x 6 x #10 reinforcing wire mesh. Outdoor concrete bases shall extend a minimum of 4" above grade and be a minimum thickness of 6".

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1 "Structural Welding Code--Steel."

3.6 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of the trades involved.

B. Repair cut surfaces to match adjacent surfaces.

END OF SECTION 22 05 00

DIVISION 22 - PLUMBING
SECTION 22 05 19 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes meters and gages used in plumbing systems.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data for each type of meter, gage, and fitting specified. Include scale range, ratings, and calibrated performance curves.

1.4 QUALITY ASSURANCE

A. Comply with applicable portions of American Society of Mechanical Engineers (ASME) and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gages.

PART 2 - PRODUCTS

2.1 THERMOMETERS, GENERAL

A. Scale Range: Temperature ranges for services listed as follows:
1. Domestic Hot Water: 30 to 240 deg F, with 2-degree scale divisions.
2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions.

B. Accuracy: Plus-or-minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

2.2 LIQUID-IN-GLASS THERMOMETERS

A. Description: ASTM E 1, liquid-in-glass thermometer.

B. Case: Die-cast aluminum finished in baked-epoxy enamel, glass front, spring secured, 9 inches long.

C. Adjustable Joint: Finished to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.

D. Tube: Red-reading, organic liquid-filled with magnifying lens.

E. Scale: Satin-faced nonreflective aluminum with permanently etched markings.

F. Stem: Copper-plated, steel, aluminum, or brass for a separable socket of length to suit installation.

2.3 THERMOMETER WELLS

A. Description: Brass or stainless-steel thermometer well.

B. Pressure Rating: Not less than piping system design pressure.

C. Stem Length: To extend to center of pipe.

D. Extension for Insulated Piping: 2 inches nominal, but not less than thickness of insulation.

2.4 PRESSURE GAGES

A. Description: ASME B40.1, Grade A phosphor-bronze Bourdon-tube pressure gage, with bottom connection.

B. Case: Drawn steel, brass, or aluminum with 4-1/2-inch -diameter glass lens.

C. Connector: Brass, 1/4-inch.

D. Scale: White-coated aluminum, with permanently etched markings.

E. Accuracy: Plus-or-minus 1 percent of range span.

F. Range: Conform to the following:
1. Fluids Under Pressure: 2 times operating pressure.

2.5 PRESSURE-GAGE ACCESSORIES

A. Snubbers: 1/4-inch brass bushing with corrosion-resistant porous-metal disc of material suitable for system fluid and working pressure.

PART 3 - EXECUTION

3.1 METER AND GAGE APPLICATIONS

A. General: Where indicated, install meters and gages of types, sizes, capacities, and with features indicated.

3.2 METER AND GAGE INSTALLATION, GENERAL

A. Install meters, gages, and accessories according to manufacturers' written instructions for applications where used.

3.3 THERMOMETER INSTALLATION

A. Install thermometers and adjust vertical and tilted positions. Install in the locations indicated on the drawings.

B. Install in the following locations and elsewhere as indicated:
1. At outlet of each water heater.
2. At inlet and outlet of each thermal mixing valve.

C. Thermometer Wells: Install in vertical position in piping tees where thermometers are indicated.
1. Install wells with stem extending to center of pipe.
2. Fill wells with oil or graphite and secure caps.

3.4 PRESSURE GAGE INSTALLATION

A. Install pressure gages in piping tee with pressure gage valve located on pipe at most readable position. Install in locations indicated on the drawings.

B. Install in the following locations and elsewhere as indicated:
   1. At discharge of each pressure-reducing valve.
   2. At building water service entrance.

C. Pressure Gage Needle Valves: Install in piping tee with snubber.

3.5 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. The Drawings indicate the general arrangement of piping, fittings, and specialties.

B. Install meters and gages adjacent to machines and equipment to allow servicing and maintenance.

3.6 ADJUSTING AND CLEANING

A. Calibrate meters according to manufacturer's written instructions, after installation.

B. Adjusting: Adjust faces of meters and gages to proper angle for best visibility.

C. Cleaning: Clean windows of meters and gages and factory-finished surfaces. Replace cracked and broken windows and repair scratched and marred surfaces with manufacturer's touchup paint.

END OF SECTION 22 05 19

DIVISION 22 - PLUMBING
SECTION 22 05 23 – GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes general duty valves common to several mechanical piping systems.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data for each valve type. Include body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions. Include list indicating valve and its application.

C. Maintenance data for valves to include in the operation and maintenance manual. Include detailed manufacturer's instructions on adjusting, servicing, disassembling, and repairing.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.
   1. ASME B1.20.1 for threads for threaded end valves.
   2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
   3. Valve solder-joint connections are common in smaller sizes of plumbing piping. Soldering and brazing methods used to achieve required pressure-temperature ratings may damage internal valve parts. Special installation requirements for soldered valves may make threaded valves more cost-effective.
   4. Caution: Use solder with melting point below 421 deg F.
   5. ASME B16.18 for solder-joint connections.
   6. ASME B31.9 for building services piping valves.

B. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

C. Bronze and brass valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted unless the alloy is heat treated.

D. MSS Compliance: Comply with the various MSS Standard Practice documents referenced.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set ball valves open to minimize exposure of functional surfaces.
   4. Block check valves in either closed or open position.

B. Use the following precautions during storage:
1. Maintain valve end protection.
2. Store indoors and maintain valve temperature higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 BASIC, COMMON FEATURES

A. Pressure and Temperature Ratings: As indicated in the "Application Schedule" of Part 3 of this Section and as required to suit system pressures and temperatures.

B. Sizes: Same size as upstream pipe, unless otherwise indicated. All valves shall be a full port design.

C. Threads: ASME B1.20.1.

D. Solder Joint: ASME B16.18.
1. Caution: Where soldered end connections are used, use solder having a melting point below 840 deg F for check valves; below 421 deg F for ball valves.

2.2 BALL VALVES

A. Brass Ball Valves, Two-Piece with Full Port, Threaded or Soldered Ends:
1. Description:
a. Standard: MSS SP-110 or MSS SP-145.
b. CWP Rating: 600 psig.
c. Body Design: Two-piece.
d. Body Material: Heat treated forged brass.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Bronze or brass.
h. Ball: Chrome plated brass.
i. Port: Full.
j. Actuator: Hand lever.

2.3 CHECK VALVES

A. Swing Check Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi CWP, or Class 150, 300-psi CWP; horizontal swing, Y-pattern, ASTM B 62 cast-bronze body and cap, rotating bronze disc with rubber seat or composition seat, threaded or soldered end connections:

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance of valves. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves from fully open to fully closed positions. Examine guides and seats made accessible by such operation.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION

A. Install valves as indicated, according to manufacturer's written instructions.

B. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties.

C. Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.

D. Locate valves for easy access and provide separate support where necessary.

E. Install valves in horizontal piping with stem at or above the center of the pipe.

F. Install valves in a position to allow full stem movement.

G. Installation of Check Valves: Install for proper direction of flow as follows:
1. Swing Check Valves: Horizontal position with hinge pin level.

H. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

I. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

J. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B828 or CDA's "Copper Tube Handbook."

K. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

L. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE END SELECTION

A. Select valves with the following ends or types of pipe/tube connections:
1. Copper Tube Size, 4 Inches and Smaller: Solder ends or threaded ends.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 4 Inches and Smaller:
1. Brass ball valves, two-piece with full port trim. Provide with threaded or solder ends.

3.5 ADJUSTING

A. Replace valves if leak is found.

END OF SECTION 22 05 23

DIVISION 22 - PLUMBING
SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes hangers and supports for mechanical systems piping and equipment.

1.3 DEFINITIONS

A. Terminology used in this Section is defined in MSS SP-90.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data for each type of hanger and support.

C. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

E. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.

1.5 QUALITY ASSURANCE

A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code--Steel."
   1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

C. NFPA Compliance: Comply with NFPA 13 for hangers and supports used as components of fire protection systems.

D. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.
   1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.

E. Licensed Operators: Use operators that are licensed by powder-operated tool manufacturers to operate their tools and fasteners.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.

1. Components include galvanized coatings or alternate rust preventing shop coating.
2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

B. Thermal-Hanger Shield Inserts: 100-psi average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.

C. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

2.2 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36, steel plates, shapes, and bars, black and galvanized.

B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.

C. Washers: ASTM F 844, steel, plain, flat washers.

D. Grout: ASTM C 1107, Grade B, non-shrink, nonmetallic.
1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is non-staining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Water: Potable.
4. Packaging: Premixed and factory-packaged.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in the Section specifying the equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.2 HANGER AND SUPPORT INSTALLATION

A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.

C. Install supports with maximum spacings complying with MSS SP-69.

D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.

F. Install concrete inserts in new construction prior to placing concrete.

G. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.

H. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

K. Support all piping direct from structure and independent of other piping.

L. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

M. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.

O. Insulated Piping: Comply with the following installation requirements.

1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.
2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.
3. Shields: Install MSS Type 40, protective shields on insulated piping. Shields span an arc of 180 degrees and have dimensions in inches not less than the following:

NPS (Inches)	LENGTH (Inches)	THICKNESS (Inches)
1/4 to 3-1/2	12	0.048
4	12	0.060
5 and 6	18	0.060
8 to 14	24	0.075
16 to 24	24	0.105

4. Pipes 6 Inches and Larger: Include shield inserts.
5. Insert Material: Length at least as long as the protective shield.
6. Thermal-Hanger Shields: Install with insulation of same thickness as piping.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.

B. Grouting: Place grout under supports for equipment and make a smooth bearing surface.

3.4 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.

B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedure for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and 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. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

C. Paint all exposed steel surfaces with one coat of primer and two coats of enamel.

END OF SECTION 220529

DIVISION 22 – PLUMBING
SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Pipe labels.
   2. Valve tags on ceiling t-bars.

1.3 ACTION SUBMITTALS

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

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

PART 2 - PRODUCTS

2.1 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.2 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters.
   1. Material: 3/32-inch-thick plastic laminate with black surfaces and a white inner layer.
   2. Size: 4 by 3/4 inch.
   3. Shape: Rectangular. Fasteners: Stainless-steel rivet, self-tapping screws or adhesive.
   4. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

PART 3 – EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Relocate mechanical identification materials and devices that have become visually blocked by work of this or other Divisions.

3.3 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

C. Label the following piping:

1. Compressed Air.
2. Domestic Water.

D. Pipe Label Color Schedule:
3. Compressed Air Piping: Safety blue with white letters.
4. Domestic Water Piping: Safety green with white letters.

3.4 VALVE-TAG INSTALLATION

A. Install tags on ceiling t-bars below above-ceiling valves.

END OF SECTION 22 05 53

DIVISION 22 - PLUMBING
SECTION 22 07 00 – PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

A. This Section includes pipe and equipment insulation.

1.3 DEFINITIONS

A. Hot Surfaces: Normal operating temperatures of 100 deg F or higher.

B. Cold Surfaces: Normal operating temperatures less than 75 deg F.

C. Thermal resistivity is designated by an r-value that represents the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivity (r-value) is expressed by the temperature difference in degrees Fahrenheit between the two exposed faces required to cause 1 BTU per hour to flow through 1 square foot at mean temperatures indicated.

D. Thermal Conductivity (k-value): Measure of heat flow through a material at a given temperature difference; conductivity is expressed in units of Btu x inch/h x sq. ft. x deg F.

E. Density: Is expressed in lb./cu.ft.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract.

B. Product data for each type of mechanical insulation identifying k-value, thickness, and accessories. Provide a summary in schedule form of intended insulation material, jacket type, thickness and adhesive type for each pipe, duct or equipment using manufacturer’s nomenclature.

1.5 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
   1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

1.6 SEQUENCING AND SCHEDULING

A. Schedule insulation application after testing of piping systems.

PART 2 - PRODUCTS

2.1 GLASS FIBER

A. Material: Inorganic glass fibers, bonded with a thermosetting resin.

B. Jacket: All-purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.

C. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.
1. Thermal Conductivity: 0.26 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F mean temperature.
2. Density: 3 pcf minimum.

D. Adhesive: Produced under the UL Classification and Follow-up service.
1. Type: Non-flammable, solvent-based.

2. Service Temperature Range: Minus 20 to 180 deg F.

2.2 INSULATING CEMENTS

A. Mineral Fiber, Hydraulic-Setting Insulating and Finishing Cement: ASTM C 449.
1. Thermal Conductivity: 1.2 Btu x inch/h x sq. ft. x deg F average maximum at 400 deg F mean temperature.
2. Compressive Strength: 100 psi at 5 percent deformation.

2.3 ADHESIVES

A. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:
1. Class 1, Grade A for sealing edges of glass fiber insulation.

2.4 JACKETS

A. General: ASTM C 921, Type 1, except as otherwise indicated.

B. Foil and Paper Jacket: Laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
1. Water Vapor Permeance: 0.02 perm maximum, when tested according to ASTM E 96.
2. Puncture Resistance: 50 beach units minimum, when tested according to ASTM D 781.

C. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20 mil thick, high-impact, ultra-violet-resistant PVC.
1. Adhesive: As recommended by insulation manufacturer.

2.5 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition.
1. Water Vapor Permeance: 0.08 perm maximum.
2. Temperature Range: Minus 20 to 180 deg F.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

B. Mix insulating cements with clean potable water. Mix insulating cements contacting stainless-steel surfaces with demineralized water.
1. Follow cement manufacturer's printed instructions for mixing and portions.

3.2 INSTALLATION, GENERAL

A. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.

B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

C. Install vapor barriers on insulated pipes, ducts, and equipment having surface operating temperatures below 60 deg F.

D. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

E. Install insulation with smooth, straight, and even surfaces.

F. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.

G. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.

H. Seal Ends: Taper ends at 45 degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.

I. Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.

J. Keep insulation materials dry during application and finishing.

K. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:
1. Vibration control devices.
2. Testing laboratory labels and stamps.
3. Nameplates and data plates.
4. Sanitary drainage and vent piping. (Drainage piping receiving air conditioning condensate shall be insulated.)
5. Drainage piping located in crawl spaces, unless indicated otherwise.
6. Below grade piping except for hot water piping.
7. Chrome-plated pipes and fittings, except for plumbing fixtures for the disabled.

3.3 PIPE INSULATION INSTALLATION, GENERAL

A. Tightly butt longitudinal seams and end joints. Bond with adhesive.

B. Stagger joints on double layers of insulation.

C. Apply insulation continuously over fittings, valves, and specialties, except as otherwise indicated.

D. Apply insulation with a minimum number of joints.

E. Apply insulation with integral jackets as follows:
1. Pull jacket tight and smooth.
2. Cover circumferential joints with butt strips, at least 3 inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.
3. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.
4. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.
5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.
6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

F. Wall and Partition Penetration: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

G. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire-rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with a U.L. Listed firestopping or fire-resistant joint sealer.

H. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply pre-molded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.
1. Use same material and thickness as adjacent pipe insulation.
2. Overlap nesting insulation by 2 inches or 1-pipe diameter, which ever is greater.
3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
4. Insulate elbows and tees smaller than 3 inches pipe size with pre-molded insulation.
5. Insulate elbows and tees 3 inches and larger with pre-molded insulation or insulation material segments. Use at least 3 segments for each elbow.
6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.

I. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments."

3.4 GLASS FIBER PIPE INSULATION INSTALLATION

A. Bond insulation to pipe with lagging adhesive.

B. Seal exposed ends with lagging adhesive.

C. Seal seams and joints with vapor barrier compound.

3.5 JACKETS

A. Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2 inches laps at longitudinal joints and 3-inch-wide butt strips at end joints.
1. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound (mastic) and glass tape (glassfab).

3.6 APPLICATIONS

A. General: Materials and thicknesses are specified in schedules at the end of this Section.

B. Piping Systems: Unless otherwise indicated, insulate the following piping systems:
1. Domestic cold water.
2. Domestic hot water.
3. Recirculated hot water.
4. Drains and sanitary P-traps receiving air conditioning condensate.

3.7 PIPE INSULATION SCHEDULES

A. Schedules:
1. Domestic Cold-Water Piping: 1" rigid fiberglass insulation.
2. Domestic Hot Water and Recirculation Piping: 1" rigid fiberglass insulation.

END OF SECTION 22 07 00

DIVISION 22 - PLUMBING
SECTION 22 11 16 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Piping and fittings.
2. Piping joining materials.
3. Transition fittings.
4. Dielectric fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B88, Type L (ASTM B88M, Type B) water tube, drawn temper.

B. Soft Copper Tube: ASTM B88, Type K (ASTM B88M, Type A) water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint, press-connect, or threaded ends.

F. Copper Unions:
1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B32, lead-free alloys.

D. Flux: ASTM B813, water flushable.

E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP-5 Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 TRANSITION FITTINGS

A. General Requirements:
1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
1. Standard: ASSE 1079.
2. Pressure Rating: 125 psig minimum at 180 deg F.
3. End Connections: Solder-joint, or press-connect joint, copper alloy and threaded ferrous.

C. Dielectric Flanges:
1. Standard: ASSE 1079.
2. Factory-fabricated, bolted, companion-flange assembly.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint, threaded, or press-connect, copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric Nipples:
1. Standard: IAPMO PS 66.
2. Electroplated steel nipple complying with ASTM F1545.
3. Pressure Rating and Temperature: 300 psig at 225 deg F
4. End Connections: Male threaded or grooved.
5. Lining: Inert and noncorrosive, propylene.

PART 3 – EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install shutoff valve, hose-end drain valve and pressure gage inside the building at each domestic water-service entrance.

D. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

H. Install piping to permit valve servicing.

I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

J. Install piping free of sags and bends.

K. Install fittings for changes in direction and branch connections.

L. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

M. Install sleeves for piping penetrations of walls, ceilings, and floors.

N. Install sleeve seals for piping penetrations of concrete walls and slabs.

O. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B828 or CDA's "Copper Tube Handbook."

F. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
   1. Vertical Piping: MSS Type 8 or 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs: MSS Type 1, adjustable, steel swivel loop hanger: Hanger shall be copper-plated.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
   2. NPS 1 and NPS 1-1/4 : 72 inches with 3/8-inch rod.
   3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

E. Install supports for vertical copper tubing every 10 feet (3 m).

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
   1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
   2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
   3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
   4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection.

3.6 IDENTIFICATION

A. Identify system piping and components.

B. Label pressure piping with system operating pressure.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Piping Inspections:
      a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.

d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
   a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
   b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.9 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system according to either of the following:
    1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
    2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.10 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be the following:
1. Soft copper tube, ASTM B88, Type K (ASTM B88M, Type A) wrought-copper, solder-joint fittings; and brazed joints.

D. Aboveground domestic water piping, NPS 2 and smaller shall be the following:
1. Hard copper tube, ASTM B88, Type L (ASTM B88M, Type B; cast or wrought copper, solder-joint fittings; and soldered joints.

3.11 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Shutoff Duty: Use ball valves.
2. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 221116

DIVISION 22 - PLUMBING
SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Temperature-actuated, water mixing valves.
2. Outlet boxes.
3. Hose bibbs.
4. Wall hydrants.
5. Water-hammer arresters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 Annex.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Individual-Fixture, Water Tempering Valves:
1. Standard: ASSE 1070, thermostatically controlled, water tempering valve.
2. Pressure Rating: 125 psig minimum unless otherwise indicated.
3. Body: Lead-free Bronze body with corrosion-resistant interior components.
4. Temperature Control: Adjustable.
5. Inlets and Outlet: Threaded.
6. Finish: Rough chrome-plated bronze.
7. Tempered-Water Setting: 90 deg F.
8. Retain "Tempered-Water Design Flow Rate" Subparagraph below only if required.
9. Tempered-Water Design Flow Rate: <Insert gpm (L/s)>.

B. Emergency Fixture Water Tempering Valves:
1. Standard: ASSE 1071, thermostatically controlled, water tempering valve, listed as tempering valve.
2. Pressure Rating: 125 psig minimum unless otherwise indicated.
3. Body: Bronze.
4. Temperature Control: Manual.
5. Inlets and Outlet: Threaded.
6. Selected Primary Water Tempering Valve Size: Same size as emergency shower inlet.
7. Tempered-Water Setting: 85 deg F.
8. Valve Finish: Rough bronze.

2.4 OUTLET BOXES

A. Authorities having jurisdiction may require backflow preventers in water-supply piping or on hose-thread outlets.

B. Icemaker Outlet Boxes:
1. Mounting: Recessed.
2. Material and Finish: Enameled-steel or epoxy-painted box and faceplate.
3. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
4. Supply Shutoff Fitting: NPS 1/2 Integral or factory-installed quarter-turn brass supply stop.

2.5 HOSE BIBBS

A. Hose Bibbs: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:
1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Operation: Wheel handle.

2.6 WALL HYDRANTS

A. Non-freeze Wall Hydrants: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:
1. Standard: ASME A112.21.3M for concealed outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS ¾ or NPS 1.
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Rough Chrome plated or stainless-steel.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Bronze or brass.
11. Operating Keys(s): Two with each wall hydrant.

2.7 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:
   1. Standard: ASSE 1010 or PDI-WH 201.
   2. Type: Copper tube with piston.
   3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

B. Install outlet boxes recessed in wall or surface mounted on wall."

C. Install water-hammer arresters in water piping according to PDI-WH 201.

D. Install drain trap seal devices in floor drains outlets.

3.2 FIELD QUALITY CONTROL

A. Test specialties for leaks.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 22 11 19

DIVISION 22 - PLUMBING
SECTION 22 11 23 - WATER DISTRIBUTION PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of water distribution pumps and accessories for domestic hot water return systems:
   1. In-line circulators.
   2. Aquastats for control of pump operation.

1.3 PUMP PERFORMANCE REQUIREMENTS

A. Pump Pressure Ratings: At least equal to system maximum operating pressure at point where installed.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data including certified performance curves, weights (shipping, installed, and operating), furnished specialties, and accessories. Include startup instructions.

C. Wiring diagrams detailing wiring for power, signal, and control systems differentiating between manufacturer-installed wiring and field-installed wiring.

D. Maintenance data for each type of pump, aquastat specified to include in the Operating and Maintenance Manual.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with provisions of the following:
   1. ASME B31.9 "Building Services Piping" for piping materials and installation.
   2. UL 778 "Standard for Motor Operated Water Pumps" for construction requirements. Include UL listing and labeling.
   3. NEMA MG 1 "Standard for Motors and Generators" for electric motors. Include NEMA listing and labeling.
   4. NFPA 70 "National Electrical Code" for electrical components and installation.

B. Single-Source Responsibility: Obtain same type of pumps from a single manufacturer.

C. Design Criteria: Drawings indicate sizes, profiles, connections, and dimensional requirements of pumps. Pumps having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles do not change the design concept or intended performance as judged by the Design Professional. The burden of proof for equality of pumps is on the proposer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store pumps in a clean, dry location.

B. Retain shipping flange protective covers and protective coatings during storage.

C. Protect bearings and couplings against damage from sand, grit, or other foreign matter.

D. Comply with pump manufacturer's rigging instructions for handling and supporting.

PART 2 - PRODUCTS

2.1 PUMPS, GENERAL

A. Water Distribution Pumps: Factory assembled and tested.

B. Capacities and Characteristics: As indicated.

C. Motors: NEMA MG 1; single, multiple, or variable speed with type of enclosure and electrical characteristics indicated. Include built-in thermal-overload protection and grease-lubricated ball bearings. Motors are non-overloading within full range of pump performance curves.

D. Finish: Manufacturer's standard paint applied to factory-assembled and -tested plumbing pump units before shipping.

E. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

2.2 HORIZONTALLY MOUNTED, IN-LINE, CLOSE-COUPLED CENTRIFUGAL PUMPS

A. Description: Factory-assembled and -tested, in-line, single-stage, close-coupled, overhung-impeller centrifugal pumps designed for installation with pump and motor shaft mounted horizontal.

B. Pump Construction:
1. Casing: Radially split with threaded companion-flange connections for pumps with NPS 2 pipe connections and flanged connections for pumps with NPS 2-1/2 pipe connections.
2. Impeller: Statically and dynamically balanced, closed, and keyed to shaft.
3. Shaft and Shaft Sleeve: Steel shaft with deflector, with copper-alloy shaft sleeve. Include water slinger on shaft between motor and seal.
4. Seal: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket.
5. Bearings: Oil-lubricated; bronze-journal or ball type.
6. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.

C. Motor: Single speed, with grease-lubricated ball bearings; and resiliently or rigidly mounted to pump casing.

2.3 GENERAL-DUTY VALVES

A. Refer to other Division 22 sections for general-duty ball and check valves.

2.4 AQUASTATS

A. General Description: Metal enclosure, strap-on mounting, visible point scale, external adjustment screw, 65F to 200F operating range, rated for 120 volts, copper temperature sensing bulb.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment foundations, and conditions with Installer present for compliance with requirements for installation and other conditions affecting performance of plumbing pumps. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine roughing-in of plumbing piping systems to verify actual locations of piping connections prior to pump installation.

3.2 INSTALLATION

A. Install pumps according to the manufacturer's written installation instructions.

B. Install pumps in locations indicated and arrange to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.

C. Support pumps and piping so that weight of piping is not supported by pumps.

D. Secure aquastat to hot water return piping upstream of circulating pump.

E. Install aquastat.

3.3 CONNECTIONS

A. Connect piping to pumps as indicated. Install valves that are same size as piping connecting to pumps.

B. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

C. Install shutoff valve on suction side of in-line pumps and circulators.

D. Install check valve and throttling valve on discharge side of in-line pumps and circulators.

E. Install electrical connections for power, controls, and devices.

F. Coordinate and connect wiring of aquastats for controls of circulator pump operation.

G. Electrical power and control wiring and connections are specified in Division 26 Sections.

3.4 FIELD QUALITY CONTROL

A. Check suction piping connections for tightness to avoid drawing air into pumps.

B. Pump Controls: Set aquastats for automatic start and stop operation of pump.

3.5 COMMISSIONING

A. Final Checks Before Startup: Perform the following preventive maintenance operations and checks before startup:
   1. Verify bearing lubrication.
   2. Disconnect couplings and check motors for proper rotation. Rotation shall match direction of rotation marked on pump casing.
   3. Check that pumps are free to rotate by hand. Pumps for handling hot liquids shall be free to rotate with pump hot and cold. Do not operate pump if bound or if it drags even slightly until cause of trouble is determined and corrected.
   4. Check that pump controls are correct for required application.

B. Starting procedure for pumps with shutoff power not exceeding safe motor power:
   1. Prime pumps by opening suction valves and closing drains, and prepare pumps for operation.
   2. Open the liquid supply valves if pumps are so fitted.
   3. Open circulating line valves if pumps should not be operated against dead shutoff.
   4. Start motors.
   5. Open discharge valves slowly.

6. Check general mechanical operation of pumps and motors.
7. Close circulating piping valves once there is sufficient flow through pumps to prevent overheating.
8. Set aquastat operating temperature for 5ºF les than hot water supply temperature.

C. When pumps are to be started against closed check valves with discharge gate valves open, steps are same except open discharge gate valves some time before motors are started.

END OF SECTION 22 11 23

DIVISION 22 - PLUMBING
SECTION 22 13 16 - DRAINAGE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes sanitary drainage and vent piping inside building and to locations indicated.

1.3 DEFINITIONS

A. Sewerage Piping: Building sewer piping outside building that conveys sanitary sewage from building.

B. Service Entrance Piping: Drainage piping at entry into building between outside building sewer piping and inside drainage piping.

C. Soil, Waste and Vent Piping: Piping inside building that conveys waste water and vapors from fixtures and equipment throughout the building.

D. The following are industry abbreviations for plastic and other piping materials:
   1. PVC: Polyvinyl chloride.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
   1. Soil, Waste, and Vent Systems: 10-foot head of water.
   2. Sewerage Piping: 10-foot head of water.

1.5 SUBMITTALS

A. Product Data: For each plumbing specialty indicated. Indicate materials, finishes, dimensions, and methods of assembly of components for the following plumbing specialty products:
   1. Pipe and Fittings.
   2. Pipe Couplings.
   3. Test Results and Reports: Specified in "Field Quality Control" Article..

1.6 QUALITY ASSURANCE

A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic piping components. Include “NSF” marking for plastic drain and sewerage piping.

PART 2 - PRODUCTS

2.1 PIPES AND TUBES

A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.

B. PVC Plastic Pipe: ASTM D 2665, Schedule 40.

2.2 PIPE AND TUBE FITTINGS

A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.

B. Threaded-Fitting, End Connections: ASME B1.20.1.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311 drain, waste, and vent pipe patterns.

2.3 JOINING MATERIALS

A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.

B. Refer to Division 22 Section for commonly used joining materials.

C. Couplings: Assemblies with combination of clamps, gaskets, sleeves, and threaded or flanged parts; made by piping system manufacturer for joining system piping.

D. Transition Couplings: Coupling or other manufactured fitting same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Soil, Waste, and Vent Piping: Use the following:
1. 12-Inch NPS or smaller: PVC plastic pipe, PVC socket fittings, and solvent-cemented joints.

3.2 PIPING INSTALLATION, GENERAL

A. Refer to Division 22 Section for basic piping installation.

3.3 SERVICE ENTRANCE PIPING INSTALLATION

A. Extend building sanitary drain piping and connect to sanitary sewer piping in sizes and locations indicated for service entrances into building. Install cleanout and extension to grade at connections of building sanitary drains with building sanitary sewers.

B. Install sleeve at each service entrance pipe penetration through foundation wall. Refer to Division 22 Section for sleeves.

C. Install wall penetration system at each service entrance pipe penetration through foundation wall. Make installation watertight. Refer to Division 22 Section for wall penetration systems.

3.4 DRAINAGE AND VENT PIPING INSTALLATION

A. Make changes in direction for drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.

B. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe.

C. Straight tees, elbows, and crosses may be used on vent lines. Do not make change in direction of flow greater than 90 degrees. Use proper size of standard increasers and reducers if different sizes of piping are connected. Reducing size of drainage piping in direction of flow is prohibited.

D. Lay buried building drain piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

E. Install drainage and vent piping at the following minimum slopes, unless otherwise indicated:
1. Sanitary Building Drain: 2 percent downward in direction of flow for piping 2-inch NPS and smaller; 1 percent downward in direction of flow for piping 3-inch NPS and larger.
2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

F. Install PVC plastic drainage piping according to ASTM D 2665.

G. Install underground PVC plastic drainage piping according to ASTM D 2321.

3.5 JOINT CONSTRUCTION

A. Refer to other Division 22 sections for basic piping joint construction.

B. PVC Piping Joints: Join drainage piping according to ASTM D 2665.

C. ABS to PVC Piping Transition Joints: Make non-pressure transition joints between ABS and PVC drainage components, using fittings and procedure according to ASTM D 3138.

D. Handling of Solvent Cements, Primers, and Cleaners: Comply with procedures in ASTM F 402 for safe handling during joining of plastic pipe and fittings.

3.6 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 22 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:
1. Riser clamps, MSS Type 8 or Type 42, for vertical runs.
2. Adjustable steel clevis hangers, MSS Type 1, for individual, straight, horizontal runs .

B. Install supports according to Division 22 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for PVC plastic piping with the following maximum spacing and minimum rod diameters:
1. 1-1/2- and 2-Inch NPS: Maximum horizontal spacing, 48 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.
2. 4-Inch NPS: Maximum horizontal spacing, 48 inches with 5/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.

F. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Connect service entrance piping to exterior sewerage and drainage piping. Use transition fitting to join dissimilar piping materials.

B. Connect drainage piping to service entrance piping, and extend to and connect to the following:
   1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
   2. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
   3. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection.

3.8 ACCESSORIES INSTALLATION

A. Install accessories according to manufacturer's written instructions and as indicated.

3.9 FIELD QUALITY CONTROL

A. Inspect drainage and vent piping as follows:
   1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
   2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
      a. Roughing-In Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
      b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
   3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
   4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedure, as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
   3. Roughing-In Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10 feet of head. Water level must not drop from 15 minutes before inspection starts through completion of inspection. Inspect joints for leaks.
   4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gas tight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
   5. Repair leaks and defects using new materials and retest piping or portion thereof until satisfactory results are obtained.
   6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTING

A. Clean interior of piping system. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with 2 coats of water-based latex paint.

END OF SECTION 22 13 16

DIVISION 22 – PLUMBING
SECTION 22 13 18 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Cleanouts.
   2. Miscellaneous sanitary drainage piping specialties.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rated capacities, operating characteristics, and accessories:

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For sanitary waste piping specialties to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

2.2 CLEANOUTS

A. Cast-Iron Exposed Cleanouts: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:
   1. Standard: ASME A112.36.2M.
   2. Size: Same as connected drainage piping
   3. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
   4. Closure: Countersunk, brass plug.
   5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Exposed Floor Cleanouts: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:
   1. Standard: ASME A112.36.2M for adjustable housing with cast-iron soil pipe with cast-iron ferrule cleanout.
   2. Size: Same as connected branch.
   3. Type: Threaded, adjustable housing.
   4. Body or Ferrule: Cast iron.
   5. Clamping Device: Not required.
   6. Outlet Connection: Spigot.
   7. Closure: Plastic plug.
   8. Adjustable Housing Material: Cast iron with threads.
   9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
   10. Frame and Cover Shape: Square.
   11. Top Loading Classification: Heavy Duty.
   12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Floor-Drain, Trap-Seal Device:
1. Description: Barrier trap seal device for use with floor drains to minimize trap evaporation.
2. Construction: ABS rigid structure with silcone gasket and seal.
3. Device shall comply with the performance requirements of ASSE 1072 standard and be third party listed with IAPMO (UPC), ICC (ICC cES PMG) and ASSE.
4. Size: Same as floor drain outlet.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install blocking reinforcement for wall-mounting-type specialties.

E. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 18

DIVISION 22 - PLUMBING
SECTION 22 13 19 - SANITARY DRAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Floor drains.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 DRAIN ASSEMBLIES

A. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:
   1. Standard: ASME A112.6.3.
   2. Body Material: Gray iron.
   3. Seepage Flange: Required.
   4. Anchor Flange: Required.
   5. Clamping Device: Required.
   6. Outlet: Bottom.
   7. Top or Strainer Material: Nickel bronze.
   8. Top of Body and Strainer Finish: Nickel bronze.
   9. Top Shape: Square.
   10. Dimensions of Top or Strainer: 7 inch minimum.
   11. Top Loading Classification: Medium Duty.
   12. Trap Pattern: Standard P-trap.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
   1. Position floor drains for easy access and maintenance.
   2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
   3. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.
      a. Maintain integrity of waterproof membranes where penetrated.
   4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

DIVISION 22 - PLUMBING
SECTION 22 33 00 - ELECTRIC WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes electric water heaters and accessories.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories. Indicate dimensions, finishes and coatings, required clearances, methods of assembly of components, and piping and wiring connections.

C. Shop Drawings showing layout of each unit, including tanks, pumps, controls, related accessories, and piping.

D. Setting Drawings with templates and directions for installing foundation bolts, anchor bolts, and other anchorages.

E. Wiring diagrams from manufacturers detailing electrical requirements for electrical power supply wiring to water heaters. Include ladder-type wiring diagrams for interlock and control wiring required for final installation of water heaters and controls. Differentiate between factory-installed and field-installed wiring.

F. Field quality-control installation reports.

G. Maintenance data for water heaters to include in operation and maintenance manuals. Include startup instructions.

1.4 QUALITY ASSURANCE

A. ASHRAE Standard: Comply with performance efficiencies prescribed in ASHRAE 90.1.

B. NFPA Standard: Comply with NFPA 70, "National Electrical Code," for electrical components.

C. Listing and Labeling: Provide electrically operated water heaters, controls, and components specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in National Electrical Code, Article 100.

D. Product Options: Drawings indicate size, profiles, connections, dimensional requirements, and characteristics of water heaters and accessories and are based on specific types and models indicated. Other manufacturers' water heaters and accessories with equal performance characteristics may be considered.

1.5 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

B. Warranty Period: 3-year limited tank and 1-year limited parts warranty after date of Material Completion.

PART 2 - PRODUCTS

2.1 WATER HEATERS, GENERAL

A. Specified Manufacturer's standard components and features are acceptable where specific product requirements are not indicated.

B. Temperature Control: Adjustable thermostat, except for units where other arrangement is indicated or temperature is regulated by flow-control fitting.

C. Interior Finish: Materials that comply with requirements of applicable NSF, AWWA, or FDA and EPA regulatory standards for tasteless and odorless, potable-water-tank linings.

D. Tappings: Factory fabricated of materials compatible with tank. Include tappings for piping connections, relief valves, pressure gage, thermometer, blow down, and controls as required and others as indicated. Attach tappings to tank before testing and labeling.

E. Insulation: Fiberglass, polyurethane foam, or manufacturer's standard that is suitable for operating temperature and required insulating value. Include insulation material that surrounds entire tank except connections and controls.

F. Jacket: Steel, with baked-on enamel finish, except where otherwise specified.

G. Anode Rods: Factory installed, magnesium.

H. Combination Temperature and Pressure Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input and pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into tank.

2.2 COMMERCIAL, STORAGE, ELECTRIC WATER HEATERS

A. Description: Commercial, storage, electric water heater.

B. Storage Tank Construction: Steel with 150-psig working-pressure rating.

C. Heating Elements: Electric, screw-in or bolt-on, immersion type according to the following:
1. Up to 9-kW Input: 2 or 3 elements.
2. More than 9-kW Input: Elements arranged in multiples of 3.

D. Heating Elements: Electric, screw-in or bolt-on, immersion type arranged in multiples of 3.

E. Staging: Not exceeding 18 kW per step.

F. Temperature Control: Adjustable immersion thermostats.

G. Anode Rods: Include two anode rods.

H. Safety Control: Automatic, high-temperature-limit and low-water cutoffs.

I. Special Requirements: NSF 5 construction.

J. Vacuum Relief Valve: Comply with ASME PTC 25.3. Furnish for installation in piping.

K. Drains: Brass hose end tank drain valve.

2.3 EXPANSION TANKS

A. Description: Steel, pressured-rated tanks constructed with welded joints and epoxy finish; factory-; Schrader air valve w/ EPDM Seats. Include air per charge to minimum system-operating pressure at tank.

B. Construction: 150-psig working-pressure rating.

C. Interior Finish: Factory installed, butyl-rubber diaphragm. Materials shall comply with requirements of applicable NSF, AWWA, or FDA and EPA regulatory standards for tasteless and odorless, potable-water-tank linings.

D. Expansion Tank Supports: Provide wall brackets consisting of galvanized support bracket with stainless steel straps. Anchor support bracket to wall and strap expansion tank to bracket.

PART 3 - EXECUTION

3.1 CONCRETE BASES

A. Install concrete bases of dimensions indicated for water heaters and accessories. Refer to Division 22 Sections.

3.2 WATER HEATER INSTALLATION

A. General: Install water heaters on concrete bases. Set and connect units according to manufacturer's written instructions. Install units plumb, level, and firmly anchored in locations indicated. Maintain manufacturer's recommended clearances. Install so controls and devices are accessible for service.

B. Anchor water heaters and storage tanks to substrate.

C. Install temperature and pressure relief valves in top portion of storage water heater tanks and hot-water storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet with water piping in continuous downward pitch and discharge to closest floor drain.

D. Install vacuum relief valves in cold-water-inlet piping.

E. Install thermometers on water heater inlet and outlet piping. Thermometers are specified in Division 22 Sections.

F. Install piping adjacent to water heaters to allow service and maintenance.

3.3 EXPANSION TANK INSTALLATION

A. General: Install expansion tanks adjacent to water heaters. Expansion tanks shall be readily accessible for maintenance. Expansion tanks shall be supported independently of water piping.

B. Charge domestic-water compression tanks with air as directed by tank manufacturer’s instructions.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
   1. Connect hot- and cold-water piping to units with shutoff valves and unions.
   2. Connect hot water circulating piping to unit with shutoff valve, check valve, and union.
   3. Connect cold water to expansion tank.
   4. Make connections with dielectric fittings where piping is made of dissimilar metals. Dielectric fittings are specified in Division 22 Sections.

B. Electrical Connections: Power wiring and disconnect switches are specified in Division 26 Sections. Arrange wiring to allow unit servicing.

C. Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 COMMISSIONING

A. Startup:
1. Test and adjust operating and safety controls. Replace damaged and malfunctioning controls and equipment.

B. Perform the following final checks before startup:
1. Fill water heaters with water.
2. Check that piping system tests are complete.
3. Check for piping connection leaks.
4. Check for clear relief valve inlets, outlets, and drain piping.
5. Check operation of pumps and circulators.
6. Test operation of safety controls, relief valves, and devices.

C. Perform the following startup procedures:
1. Energize electric circuits.
2. Adjust operating controls.
3. Adjust hot-water-outlet temperature settings.

END OF SECTION 22 33 00

DIVISION 22 - PLUMBING
SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes plumbing fixtures and trim, faucets, other fittings, and related components.

1.3 DEFINITIONS

A. Accessible: Plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped, disabled, and elderly people.

B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and drains and tailpieces, traps and waste pipes. Pipe fittings, tube fittings, and general-duty valves are included where indicated.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data for each plumbing fixture category and type specified. Include selected fixture, trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

C. Wiring diagrams from manufacturer for electrically operated units.

D. Maintenance data for plumbing fixtures and components to include in the operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category from one source and by a single manufacturer.
   1. Exception: Where fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for this category.

B. Regulatory Requirements: Comply with requirements of 2010 ADA Standards for Accessible Design; regarding plumbing fixtures for physically handicapped people.

C. Energy Policy Act Requirements: Comply with requirements of Public Law 102-486, "Energy Policy Act," regarding water flow rate and water consumption of plumbing fixtures.

D. Listing and Labeling: Provide electrically operated fixtures and components specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver plumbing fixtures in manufacturer's protective packing, crating, and covering.

B. Store plumbing fixtures on elevated platforms in dry location.

1.7 PROJECT CONDITIONS

A. Field Measurements: Coordinate roughing-in and final fixture locations and verify that plumbing fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURE STANDARDS

A. Comply with applicable standards below and other requirements specified.
1. Electric Water Coolers: ARI 1010 and UL 399.
2. Emergency Equipment: ANSI Z358.1.
3. Stainless-Steel Fixtures Other than Service Sinks: ASME A112.19.3M.
4. Vitreous-China Fixtures: ASME A112.19.2M.

2.2 LAVATORY/SINK FAUCET STANDARDS

A. Comply with ASME A112.18.1M and other requirements specified for lavatory, sink, and similar-type-fixture faucet fittings. Include hot- and cold-water indicators; 2.0-gpm-maximum flow rate; and polished, chrome-plated finish; except where otherwise indicated. Coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.

1. Hose-Connection Vacuum Breakers: ASSE 1011.
2. Hose-Coupling Threads: ASME B1.20.7.
3. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
4. Pipe Threads: ASME B1.20.1.

2.3 SHOWER FAUCET STANDARDS

A. Comply with ASME A112.18.1M and other requirements specified for shower faucet fittings. Include hot- and cold-water indicators; 2.5-gpm-maximum flow rate; and polished, chrome-plated finish; except where otherwise indicated. Coordinate faucet inlets with supplies and outlet; and shower head, arm, and flange.
1. Hand-Held Showers: ASSE 1014.
2. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
3. Hose-Coupling Threads: ASME B1.20.1 or ASME B1.20.7.
4. Pipe Threads: ASME B1.20.1.
5. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

2.4 MISCELLANEOUS FITTING STANDARDS

A. Comply with ASME A112.18.1M and other requirements specified for fittings, other than faucets. Include polished, chrome-plated finish, except where otherwise indicated. Coordinate fittings with other components and connectors.
1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Automatic Flow Restrictors: ASSE 1028.
3. Brass and Copper, Supplies and Tubular Brass: ASME A112.18.1M.
4. Fixed Flow Restrictors: ASSE 1034.
5. Manual-Operation Flushometers: ASSE 1037.

2.5 MISCELLANEOUS COMPONENT STANDARDS

A. Comply with applicable standards below and other requirements specified for components for plumbing fixtures, equipment, and appliances.
1. Hose-Coupling Threads: ASME B1.20.7.
2. Pipe Threads: ASME B1.20.1.
3. Plastic Toilet Seats: ANSI Z124.5.
4. Supply and Drain Insulation Kits: CABO A117.1.

2.6 FITTINGS

A. Supplies:
1. Supply Inlet: Brass pipe or copper tube, size required for final connection.
2. Supply Stops: Chrome-plated brass, angle; chrome-plated brass ball; quarter-turn operation; ½" compression inlet and 3/8" o.d. compression outlet; same size as supply inlet and with outlet matching supply riser, chrome handle.
3. Supply Risers: 3/8" NPS flexible chrome-plated copper tube with knob end.

B. Traps and Wastes:
1. Traps: Tubular brass with 0.045" (17 ga.) Wall thickness, slip-joint inlet, cleanout, wall flange, escutcheons, and size to match equipment. Use chrome-plated tube for exposed applications.
2. Continuous Waste: Tubular brass, 0.045" (17 ga.) Wall thickness, with slip-joint inlet, and size to match equipment.
3. Indirect Waste: Hard copper DWV tube and solder joint fittings; size to match equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for potable, hot- and cold-water supply piping systems; soil, waste, and vent piping systems; and supports. Verify that locations and sizes of piping and locations and types of supports match those indicated, before installing and connecting fixtures. Use manufacturer's roughing-in data when roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Secure wall-mounted fixtures and fixture brackets to concrete walls and concrete block walls with sleeve-type anchors:
1. Sleeve type anchors shall feature a split expansion sleeve over a threaded stud bolt body and integral expander, nut and washer. Anchors shall be tested to ASTM E488 standards.
2. Anchors shall have zinc-plated carbon steel construction or Type 304 stainless steel construction.
3. Anchors should be installed with carbide tipped hammer drill bits made in accordance to ANSI B212.15-1994

B. Include supports for plumbing fixtures according to the following:
1. Reinforcement: For floor-mounted lavatories and sinks that require securing to wall and recessed, box-mounted, electric water coolers.
2. Fabricate reinforcement from 2-by-4-inch or 2-by-6-inch blocking between studs or 1/4-by-6-inch steel plates attached to studs, in wall construction, to secure fixtures to wall. Include length that will extend beyond ends of fixture mounting bracket and attach to at least 2 studs.

C. Include fitting insulation kits for accessible fixtures according to the following:

1. Lavatories: Cover hot- and cold-water supplies, stops and handles, drain, trap, and waste to wall.
2. Sinks: Cover hot- and cold-water supplies, stops and handles, drain, trap, and waste to wall.
3. Fixtures with Offset Drain: Cover hot- and cold-water supplies, offset drain, trap, and waste to wall.
4. Other Fixtures: Cover exposed fittings below fixture.

3.3 PLUMBING FIXTURE INSTALLATION

A. Assemble plumbing fixtures and trim, fittings, faucets, and other components according to manufacturers' written instructions.

B. Install fixtures level and plumb according to manufacturers' written instructions, roughing-in drawings, and referenced standards.

C. Install floor-mounted, floor-outlet water closets with fittings and gasket seals.

D. Install toilet seats on water closets.

E. Install wall-hanging, back-outlet urinals with gasket seals.

F. Install actuators in locations that comply with ADA standards.

G. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment.

H. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.

I. Fasten floor-mounted fixtures to substrate. Fasten fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.

J. Fasten recessed, wall-mounted fittings to reinforcement built into walls.

K. Fasten wall-mounted fittings to reinforcement built into walls.

L. Fasten counter-mounting plumbing fixtures to casework.

M. Secure supplies to supports or substrate within pipe space behind fixture.

N. Set mop basins in leveling bed of cement grout.

O. Install individual stop valve in each water supply to fixture. Use ball valves where specific stop valve is not specified.

P. Install water-supply stop valves in accessible locations.

Q. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.

R. Install shower, flow-control fittings with specified maximum flow rates in shower arms.

S. Install traps on fixture outlets. Omit traps on fixtures having integral traps. Omit traps on indirect wastes, except where otherwise indicated.

T. Install escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.

U. Seal joints between fixtures and walls, floors, and counters using sanitary-type, 1-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other Division 22 Sections.

B. Supply and Waste Connections to Plumbing Fixtures: Refer to plumbing fixture schedules at the end of this Section for fitting sizes and connection requirements for each plumbing fixture.

C. Supply and Waste Connections to Equipment Specified in Other Sections: Connect equipment with supply inlets, supply stops, supply risers, and traps specified in this Section. Use fitting sizes required to match connected equipment. Connect fittings to plumbing piping.

D. Ground equipment.

E. Arrange for electric-power connections to fixtures and devices that require power. Electric power is specified in Division 26 Sections.

3.5 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized and demonstrate proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.6 ADJUSTING AND CLEANING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at drinking fountains, electric water coolers, faucets, shower valves, and flushometer valves having controls, to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

D. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Include the following:
1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities, except when approved in writing by Owner.

3.8 WATER CLOSET SCHEDULE - FLUSH VALVE TYPE

A. Water Closet: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:
1. Vitreous-china Water closet with the following:
   a. Accessible ADA height
   b. Floor-mounting, floor-outlet.
   c. Antimicrobial glaze to inhibit bacteria growth.
2. Flushometer Valve Operation: Diaphragm.
3. Flushometer Valve Finish: Polished, chrome-plated, exposed metal parts.
4. Flushometer Valve, Water Consumption: Factory set 1.28 gal. maximum per flushing cycle.

5. Flushometer valve components include the following:
   a. Brass, lever-handle actuation.
   b. Non-hold-open feature.
6. Toilet Seat: Solid-plastic, water-closet seat with bumpers and hardware, compatible with water closet and as follows:
   a. Class: Commercial, Extra-Heavy-Duty type, exceeding requirements of Commercial, Standard class.
   b. Size: Elongated.
   c. Hinge Type: Self-sustaining check (SC).
7. Water Closet Floor Flange: PVC closet flange with adjustable slotted metal ring.

3.9 URINAL SCHEDULE

A. Urinal: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:
1. Vitreous-china Urinal with the following:
   a. ADA-compliant.
   b. Wall-mounting, wall-outlet.
   c. Antimicrobial glaze to inhibit bacteria growth.
2. Flushometer Valve Construction: Cast-brass body, brass or copper pipe or tubing inlet with wall flange and tailpiece with spud, screwdriver check stop, and vacuum breaker.
3. Flushometer Valve Operation: Diaphragm.
4. Flushometer Valve Finish: Polished, chrome-plated, exposed metal parts.
5. Flushometer Valve, Water Consumption: Factory set 0.5 gal. maximum per flushing cycle.
6. Flushometer valve components include the following:
   a. Brass, lever-handle actuation.
   b. Non-hold-open feature.
7. Fixture Support: Type I, vertically adjustable, urinal, chair carrier with coupling; heavy-duty, rectangular-steel, upright members; bearing plate; and feet.

3.10 LAVATORY SCHEDULE

A. Lavatory: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:
1. Vitreous-china Lavatory with the following:
   d. ADA-compliant.
   e. Wall-mounting with backsplash.
   f. Antimicrobial glaze to inhibit bacteria growth.
2. Supplies: See Fittings section of this specification.
3. Faucet Construction: Cast brass with ceramic cartridges and polished chrome finish.
4. Faucet Water Consumption: 1.5 or 0.5 gpm as specified on drawings.
5. Supply Insulation Kit: Molded, soft-plastic covering for supplies from wall to fixture with removable covering for stops and handles. Include manufacturer's standard fasteners, straps, and adhesives.
6. Drain Insulation Kit: Molded, soft-plastic covering for drain piping from fixture to wall. Include manufacturer's standard fasteners, straps, and adhesives.
7. Fixture Support Frame: Concealed adjustable arms and mechanical locking device; vertically adjustable, lavatory, floor-mounted carrier with heavy-duty, rectangular-steel, upright members with welded bases

3.11 SHOWER SCHEDULE

A. Shower: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:
1. Faucet Construction: Cast-brass, pressure-equalizing-control{ with high-temperature-limit control}, single-handle mixing valve with check stops, and escutcheon.
2. Faucet Components: Include the following:
   a. Handle{s}: Single-lever, chrome-plated brass.
   b. Shower Head, Arm, and Flange: Manufacturer's standard with manual flow control in head.

c. Shower Arm, Flow-Control Fitting: 2-1/2 gpm.
d. Hand Shower, Hose, and Brackets or Slide: Manufacturer's standard.
e. Hose-Supply, Flow-Control Fitting: 2-1/2 gpm.

3. Supplies: Copper tubing with ball, gate, or globe valve if check stops not included with faucet.

3.12 SINK SCHEDULE

A. Accessible: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the Drawings:
1. Fixture Construction: 18 gauge stainless-steel.
2. Fixture Mounting: Counter, self-rimming.
3. Faucet Construction: Cast brass with ceramic cartridges and polished chrome finish.
4. Faucet Water Consumption: 2.0 gpm maximum flow.
5. Drain{s}: 1-1/2-inch removable, stainless-steel strainer bucket with 3-1/2-inch removable, stainless-steel crumb cup with 1-1/2-inch NPS tubular-brass tailpiece.
6. Supplies: See Fittings section of this specification.

3.13 SERVICE SINK SCHEDULE

A. Service Sink: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:
7. Fixture Construction: 18 gauge stainless-steel with sink ledge.
1. Fixture Mounting: Free-standing with four legs.
2. Faucet Construction: Cast brass with ceramic cartridges and polished chrome finish.
3. Faucet Water Consumption: 2.0 gpm maximum flow.
4. Drain{s}: 1-1/2-inch removable, stainless-steel strainer bucket with 3-1/2-inch removable, stainless-steel crumb cup with 1-1/2-inch NPS tubular-brass tailpiece.
5. Supplies: See Fittings section of this specification.

3.14 MOP-SERVICE BASIN SCHEDULE

A. Mop-Service Basin: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:
1. Fixture Dimensions: See Plumbing Fixture Schedule on drawings.
2. Mop Sink shall be made of precast terrazzo to produce a compressive strength of not less than 3,000 PSI seven days after casting. All exposed surfaces shall be ground smooth and sealed. No air holes or pits shall be allowed on the finished surface. Sink shall have coved corners and be pitched to the outlet for positive drainage. Integral drain shall have a stainless steel strainer and provide for an inside caulked connection to a 3" pipe.
3. Mounting: Floor.
4. Rim Guard: Manufacturer's standard.
5. Faucet: Widespread, cast brass with supplies on 8-inch centers.
6. Faucet Mounting: Wall, centered on fixture.
7. Faucet Components: Include the following:
a. Finish: Rough chrome.
b. Handles: Dual lever or 4 arm.
c. Supply Stops: Integral, in shanks.
d. Spout: With integral vacuum breaker, pail hook, and hose-thread outlet.
e. Wall Brace: Assembly with wall bracket and support to faucet spout.
f. Hose: 30-inch-minimum, flexible hose with stainless-steel hose wall bracket.
8. Drain: 3-inch NPS with grid strainer.
9. P-Trap: 3-inch NPS drainage piping.
10. Supplies: 1/2-inch NPS copper tubing with supply stop.
11. Reinforcement: Provide for wall-mounting faucet, wall brace, and hose-hook bracket.

3.15 ELECTRIC WATER COOLER SCHEDULE

A. Electric Water Cooler: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:

1. Enhanced Bottle Filler & Bi-Level ADA Cooler Refrigerated Light Gray Granite High Capacity Lead Drop Down Wrapper. Chilling Capacity of 8.0 GPH (gallons per hour) of 50° F drinking water, based on 80° F inlet water and 90° F ambient, per ASHRAE 18 testing. Features shall include Energy Savings, Filtered, Hands Free, Laminar Flow, Alcove Light. Furnished with flexible bubbler. Electronic Bottle Filler Sensor with Electronic Front and Side Bubbler Pushbar activation. Product shall be Wall Mount (On Wall), for Indoor applications, serving 2 station(s). Unit shall be certified to UL 399 and CAN/CSA C22.2 No. 120.
2. Supply: 3/8-inch NPS copper tubing with supply stop.

3.16 EMERGENCY EQUIPMENT SCHEDULE

A. Emergency Eyewash Shower: Where plumbing fixtures of this designation are indicated, provide products complying with the following and with the Plumbing Fixture Schedule on the drawings:
1. Barrier Free, combination eye/face wash and shower safety station with ABS plastic shower head, internal 20 GPM flow control, ABS plastic eyewash bowl, schedule 80 PVC 2 1/2″ floor flange, 1-1/2” epoxy finished Schedule 80 PVC pipe stanchion pipe and fittings, 1” IPS and ½” IPS stainless steel stay-open ball valves, and stainless steel pull rod. Unit shall include ANSI compliant sign.
2. Complaince: Unit shall comply with ADA requirements for accessibility by handicapped persons. Unit shall meet or exceed ANSI Z358.1.
3. Mounting: Floor, with wall brace.
4. Supply: 1 ¼” NPS copper tubing.
5. Drain: Manufacturer's standard.

3.17 KITCHEN EQUIPMENT FURNISHED BY OTHER DIVISION

A. Kitchen Fixture Equipment: Where plumbing fixtures of this designation are indicated and provide products complying with the following and with the drawings:
1. Products: Subject to compliance with requirements, provide one of the following:
2. Supply Inlet: 1/2-inch NPS
3. Supply Stop: Ball valve.
4. Supply Riser: Rigid copper supply, size as determined by equipment inlet.
5. Drain: Connect to equipment drain outlet and route drain piping to drain receptor. Use DWV copper piping and fittings. Make indirect connection at drain receptor unless noted otherwise.

END OF SECTION 22 40 00

DIVISION 22 - PLUMBING
SECTION 22 60 11 - COMPRESSED-AIR PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes piping and specialties for building compressed-air systems operating at 200 psig and less.

1.3 SUBMITTALS

A. Coordination Drawings: For compressed-air equipment and piping, including relationship to other services that serve same work areas.

1.4 QUALITY ASSURANCE

A. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.

B. Listing and Labeling: Provide equipment and accessories specified in this Section that are listed and labeled.
   1. Terms "Listed" and "Labeled": As defined in National Electrical Code, Article 100.

PART 2 - PRODUCTS

2.1 PIPING, GENERAL

A. ASME Code Compliance: Provide compressed-air piping components complying with ASME B31.9, "Building Services Piping."

B. ASME Code Compliance: Provide compressed-air piping components complying with the following:
   1. ASME B31.9, "Building Services Piping."
   2. ASME B31.1, "Power Piping."

2.2 PIPES AND TUBES

A. Steel Pipe: ASTM A 53, Type E, Electric-Resistance Welded or Type S, Seamless, Grade B, Schedule 40, black or hot dipped, zinc coated.

2.3 PIPE AND TUBE FITTINGS

A. Malleable-Iron Pipe Fittings: ASME B16.3, Class 150, threaded, galvanized.

B. Transition Fittings: Type, material, and end connections to match piping being joined.

2.4 JOINING MATERIALS

A. Refer to Division 22 Sections for joining materials not in this Section.

2.5 VALVES

A. Special-Duty, Compressed-Air Valves: Include PTFE seats and comply with the following:
   1. Ball Valves, 2-Inch NPS (DN50) and Smaller: MSS SP-110; 2-piece bronze body with blowout-proof stem; regular or full port; chrome-plated, solid-brass or -bronze ball; threaded ends; and 600-psig minimum WOG pressure rating.

2.6 SPECIALTIES

A. Safety Valves: ASME Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels" construction, National Board certified, labeled, and factory sealed; constructed of bronze body with poppet safety valve for compressed-air service.
   1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.

B. Pressure Regulators: Aluminum alloy or plastic body, diaphragm operated, direct acting, spring loaded, manual pressure-setting adjustment, and rated for 250-psig inlet pressure, except where otherwise indicated.

C. Air-Line Lubricators: Sizes and capacities indicated; equip with drip chamber and sight dome for observing oil drop entering airstream; with oil-feed adjustment screw and quick-release collar for easy bowl removal.
   1. Provide with automatic feed device for supplying oil to lubricator.

D. Filters: 2-stage, mechanical-separation type, air-line filters in sizes and ratings indicated. Equip with deflector plates; resin-impregnated-ribbon-type filters with edge filtration, 40 micron thick; and drain cock.

E. Coalescing Filters: Capacities and types indicated. Equip with activated carbon capable of removing water and oil aerosols, with color-change dye to indicate when carbon is saturated and warning light to indicate when selected maximum pressure drop has been exceeded.

F. Automatic Drain Valves: Corrosion-resistant metal body and internal parts, rated for 200-psig minimum working pressure, capable of automatic discharge of collected condensate.

G. Couplings: Provide compatible hose couplings, suitable for compressed-air service, of nominal diameter, and rated for 300-psig minimum working pressure, except where otherwise indicated.
   1. Quick Connect/Disconnect Hose Couplings: 0.25-inch inlet, straight through, brass body, with stainless-steel or nickel-plated steel operating parts. Select socket end with O-ring or gasket seal and without valve. Select socket and plug ends with serrated outlet for hose.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. ASME Code Compliance: Provide compressed-air piping components complying with ASME B31.9, "Building Services Piping."

B. ASME Code Compliance: Provide compressed-air piping components complying with the following:
   1. ASME B31.9, "Building Services Piping."
   2. ASME B31.1, "Power Piping."

C. Install flanges, unions, transition and special fittings, and valves with pressure ratings same or higher than system pressure rating used in applications below, except where otherwise specified.

D. Compressed-Air, Distribution Piping: Use the following:
   1. 2-Inch NPS and Smaller: Galvanized steel pipe; galvanized, threaded, malleable-iron fittings; and threaded joints.

3.2 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Shutoff Duty: Use ball valves.

B. Grooved-end butterfly valves in sizes available may be used with grooved-end piping.

3.3 PIPING INSTALLATION, GENERAL

A. Refer to Division 22 Sections for basic piping installation.

B. Install air and drain piping with one percent slope downward in direction of airflow.

C. Install eccentric reducers where pipe is reduced in size in direction of airflow, with bottoms of both pipes and reducer flush.

D. Connect branch air piping to mains from top of main. Provide drain leg and drain trap at end of each main, branch, and low point in piping.

E. Install supports and anchors according to other Division 22 Sections. Do not exceed the following spacing between pipe hangers:
   1. Steel Pipe: 12 feet horizontal and 15 feet vertical.

F. Install valves according to Division 22 Sections.

G. Install plumbing specialties according to Division 22 Sections.

3.4 JOINT CONSTRUCTION

A. Refer to Division 22 Sections for basic piping joint construction.

B. Dissimilar Material Piping Joints: Make joints using adapters compatible with both piping materials.

3.5 CONNECTIONS

A. Install piping next to equipment and accessories to allow service and maintenance.

B. Connect air piping to equipment and accessories with unions and shutoff valves. Install with strainers where indicated.
   1. Install pressure gages on compressor discharge piping, on receiver tanks, and where indicated.

C. Install safety valves in receiver tanks, in quantity and size to relieve capacity not less than that of connected compressor.

D. Install automatic drain valves on intercoolers, aftercoolers, separators, receivers, dryers, and other locations indicated. Discharge condensate over nearest floor drain.

E. Install specialties as indicated.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly of components and piping, and to report results in writing.

B. Test and adjust piping safety controls. Replace damaged and malfunctioning controls.

C. Piping System Tests: Test new and modified parts of existing piping. Cap and fill compressed-air piping with oil-free, dry air, or gaseous nitrogen to pressure of 50 psig above system operating pressure, but not less than 150 psig. Isolate test source and let stand for 4 hours to equalize temperature. Refill system, if required, to test pressure and hold pressure for 2 hours with no drop in pressure.
   1. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

3.7 COMMISSIONING

A. Perform the following final checks before startup:
   1. Verify that specified tests of piping are completed.
   2. Check for piping connection leaks.
   3. Check for lubricating oil in lubricated-type equipment.
   4. Check V belts for proper tension.
   5. Check that compressor inlet filters and piping are clear.
   6. Check for equipment vibration-control supports and flexible pipe connectors and that equipment is properly attached to substrate.
   7. Check safety valves for correct settings. Ensure settings are greater than air-compressor discharge pressure, but not greater than rating of system components.
   8. Test operation of equipment safety controls and devices.
   9. Drain receiver tanks.
   10. Check for adequate room ventilation.

B. Starting Procedures: Follow manufacturer's written instructions. If no instructions are prescribed by manufacturer, proceed as follows:
   1. Energize circuits.
   2. Start and run equipment through complete sequence of operations.
   3. Check for excessive vibration and noise. Correct problems.
   4. Check air pressures.
   5. Manually operate safety valves.
   6. Adjust operating controls, including pressure settings.

C. Operate and adjust operating and safety controls. Replace damaged and malfunctioning controls and equipment discovered by service representative.

END OF SECTION 22 60 11

DIVISION 22 - PLUMBING
SECTION 22 60 12 - COMPRESSED-AIR EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes equipment and accessories for building compressed-air systems operating at 200 psig and less.

1.3 DEFINITIONS

A. Low-Pressure, Compressed-Air Systems: ASME B31.9, "Building Services Piping," for systems operating at pressure of 125 psig or less and at temperature of 200 deg F or less.

B. Medium-Pressure, Compressed-Air Systems: ASME B31.1, "Power Piping," for systems operating at pressure between 125 and 200 psig, or at temperature of more than 200 deg F.

1.4 SUBMITTALS

A. Product Data: For each model indicated. Include rated capacities of air compressors specialties and accessories; shipping, installed, and operating weights; furnished specialties; and accessories. Indicate dimensions, required clearances, methods of assembly of components, and piping and wiring connections.

B. Wiring Diagrams: For each item of equipment with electric power supply. Include ladder-type wiring diagrams for interlock and control wiring required for final installation. Differentiate between factory-installed and field-installed wiring.

C. Coordination Drawings: For compressed-air equipment and piping, including relationship to other services that serve same work areas.

D. Certificates of Shop Inspection and Data Report: As required by ASME Boiler and Pressure Vessel Code.

E. Maintenance Data: For equipment to include in the maintenance manuals specified in other Divisions.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of compressed-air equipment and accessories and are based on specific types and models indicated. Other products with equal performance characteristics, made by specified manufacturers, may be considered.

B. Electrical Component Standard: NFPA 70.

C. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.

D. Listing and Labeling: Provide equipment and accessories specified in this Section that are listed and labeled.
   1. Terms "Listed" and "Labeled": As defined in National Electrical Code, Article 100.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store equipment and large accessories on factory-installed shipping skids and small accessories in factory-fabricated fiberboard containers.

PART 2 - PRODUCTS

2.1 AIR COMPRESSORS, GENERAL

A. General: Factory-assembled and -tested packaged units; simplex, duplex, or multiplex units; and with capacities, features, and electrical characteristics indicated.

B. Construction of Equipment: ASME B19.1, "Safety Standard for Air Compressor Systems"; or ASME B19.3, "Safety Standard for Compressors for Process Industries," as appropriate.

C. Control Panels: Automatic control station with load control and protection functions. Comply with NEMA ICS 2, "Industrial Controls and Systems: Controllers, Contactors and Overload Relays, Rated Not More than 200 Volts AC or 750 Volts DC"; and UL 508, "Industrial Control Equipment."
   1. Mounting and Wiring: Factory installed and connected as an integral part of equipment package.
   2. Enclosure: NEMA ICS 6, "Industrial Control and Systems: Enclosures," Type 12 control panel, except where a higher degree of enclosure is specified.
   3. Motor Controllers: Full-voltage, combination-magnetic type with under-voltage release feature and motor-circuit-protector-type disconnect and short-circuit protective device.
      a. Control Voltage: 120 V, ac or less, using integral control power transformer.
      b. Motor Overload Protection: Overload relay in each phase.
      c. Starting Devices: Hand-off-automatic selector switch in cover of control panel, plus pilot device for automatic control as indicated.

D. Instrumentation: Include air-receiver pressure gage, discharge-line pressure gage, air-filter maintenance indicator, hour meter, compressor discharge air and coolant temperature gage, and control transformer.

E. Receiver Tanks: ASME Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels" construction and bear appropriate code symbols, with pressure gage, pressure-reducing valve, and automatic drain.

F. Factory re-piping: Entire unit, except where otherwise indicated.

2.2 SAFETY VALVES

A. Safety Valves: Poppet type complying with ASME Boiler and Pressure Vessel Code, Section VIII, bear appropriate labeling, and factory sealed after testing.

2.3 RECIPROCATING AIR COMPRESSORS

A. Description: Tank-mounted, lubricated, reciprocating air compressors, with inlet silencer filter, safety valve, discharge pressure gage, pressure regulator, and shutoff valve.

B. Receiver Tank Orientation: Vertical.

2.4 ACCESSORIES

A. General: Include accessories with working-pressure rating not less than system pressure at location where used, and compatible with equipment and piping system used.

B. Receivers and Tanks: ASME stamped; cylindrical, vertical or horizontal installation as indicated; galvanized steel; with safety valves in sizes, working pressures, and temperatures indicated, and with drain connection.
   1. Pressure Rating: Not less than maximum discharge pressure.

C. Electric Compressor tank and Receiver Valves:
   1. Operation: Removes moisture at timed intervals to prevent corrosion and protect compressed air systems.

2. Adjustable Interval & Discharge Settings: Programmable to open every 0.05 to 45 minutes and discharge for 0.05 to 10 seconds.
3. Durable Forged Brass Construction: Rated for up to 230 PSI with IP65 / NEMA 4-rated protection against dust, water, and tampering.
4. Easy Monitoring & Manual Control: Features a manual override for on-demand draining and an LED power indicator to confirm operational status at a glance.
5. Installation & Safety Features: Equipped with 6 ft. power cord, protective caps, O-rings, and backed by a 1-year warranty—UL and CE approved.

2.5 SPECIALTIES

A. Safety Valves: ASME Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels" construction, National Board certified, labeled, and factory sealed; constructed of bronze body with poppet safety valve for compressed-air service.
   1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.

B. Hose Reels: Steel hose reel assembly with spring loaded return; steel base plate; 50 feet of 3/8” air hose rated for 2600 psi with ball stop and threaded outlet; powder coated reel assembly; brass swivel.

PART 3 - EXECUTION

3.1 CONCRETE BASES

A. Install concrete bases of dimensions indicated for air compressors and accessories. Refer to other Division Sections.

3.2 EQUIPMENT INSTALLATION

A. Installation of Equipment: Comply with ASME B19.1 or ASME B19.3 as appropriate.

B. Install air compressors,, air-receiver tanks, and dryers on concrete bases. Set and connect units according to manufacturers' written instructions. Install units plumb, level, and firmly anchored in locations indicated. Maintain manufacturers' recommended clearances. Orient so equipment, controls, and devices needing service are accessible.

C. Anchor air compressors, receivers, and other equipment to substrate.

D. Support air compressors using the following vibration-control devices, unless otherwise indicated. Refer to Division 22 Section "Vibration Control."
   1. Install tank-mounted compressors isolation pads.

E. Install accessories and specialties as indicated. Set and connect units according to manufacturers' written instructions. Install units plumb, level, and firmly anchored in locations indicated. Maintain manufacturers' recommended clearances. Orient so controls needing service are accessible.

3.3 CONNECTIONS

A. Install piping next to equipment and accessories to allow service and maintenance.

B. Connect air piping to equipment and accessories with unions and shutoff valves. Install with strainers where indicated.
   1. Install pressure gages on compressor discharge piping, on receiver tanks, and where indicated.

C. Install safety valves in receiver tanks, in quantity and size to relieve capacity not less than that of connected compressor.

D. Install electronic adjustable automatic drain valves on compressor receivers and tanks. Discharge condensate over nearest floor drain.

E. Install accessories as indicated.

F. Ground equipment. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

G. Arrange for electric-power connections to equipment that requires power. Electric power, wiring, and disconnect switches are specified in Division 26 Sections.

3.4 FIELD QUALITY CONTROL

A. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 COMMISSIONING

A. Perform the following final checks before startup:
1. Verify that specified tests of piping systems are completed.
2. Check for piping connection leaks.
3. Check for lubricating oil in lubricated-type equipment.
4. Check V belts for proper tension.
5. Check that compressor inlet filters and piping are clear.
6. Check for equipment vibration-control supports and flexible pipe connectors and that equipment is properly attached to substrate.
7. Check safety valves for correct settings. Ensure settings are greater than air-compressor discharge pressure, but not greater than rating of system components.
8. Test operation of equipment safety controls and devices.
9. Drain receiver tanks.
10. Check for adequate room ventilation.

B. Starting Procedures: Follow manufacturer's written instructions. If no instructions are prescribed by manufacturer, proceed as follows:
1. Energize circuits.
2. Start and run equipment through complete sequence of operations.
3. Check for excessive vibration and noise. Correct problems.
4. Check air pressures.
5. Manually operate safety valves.
6. Adjust operating controls, including pressure settings and drain valve settings.

C. Operate and adjust operating and safety controls. Replace damaged and malfunctioning controls and equipment discovered by service representative.

END OF SECTION 22 60 12

DIVISION 23 - HVAC
SECTION 23 00 00 - GENERAL HVAC PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes general provisions covering the contract documents for HVAC Systems.

B. All equipment provided in this project shall qualify as “Made in America”.

1.3 DEFINITIONS

A. Provide shall mean "Furnish, install and connect."

B. Piping shall mean "pipe installed with all specified fittings, valves and accessories, and forming a complete system."

C. HVAC shall mean "Heating, Ventilation and Air Conditioning."

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Electrical Coordination: In addition to submittal requirements of other Division 23 Sections, submit a document approved by the project Electrical Contractor certifying that all mechanical equipment being furnished under Division 23 complies with the electrical characteristics of the source power which will be furnished under Division 26.

C. Extra Materials: Where specification sections call for extra materials (i.e., filters, etc.) submit a complete list of all such materials including total quantities and sizes for review. Delivered quantities will be verified at the completion of the project.
   1. Upon delivery of the extra materials to the Owner, an Owner’s representative shall sign the materials list certifying receipt.
   2. The signed receipt shall be included in the closeout documents.

D. Model numbers listed on the Mechanical Contract Documents shall not be construed to indicate electrical characteristics. Electrical characteristics of mechanical equipment shall be as indicated on the Electrical Contract Documents (Division 26).

E. Review of Submittals does not relieve the Contractor of any of the requirements of the Contract Documents. Failure by the Engineer to document errors and omissions in the Contractor's submittals during the Engineer's submittal review does not constitute a waiver of any of the requirements of the original sealed Contract Documents.

1.5 CONTRACTOR QUALIFICATIONS

A. HVAC Subcontractor shall have a current Class II (Non-restricted) Conditioned Air Contractors License for the state in which the project is being constructed. The Subcontractor shall have as part of the Firm a Service Department qualified to service all systems installed in the project or have a written agreement with a Service Agency qualified to provide such service. The Service Department or Agency shall be on call at all hours. The subcontractor shall have installed at least (within the last five years):
   1. Three Dx system buildings of at least 100-tons total capacity with more than one system in excess of 5-tons

1.6 LAYOUT AND COORDINATION

A. Layout Basis:
1. The equipment listed on the drawing schedules or in the technical specifications as “basis of design” has been used for the physical arrangement of the mechanical systems. When equipment provided by other manufacturers is used, it shall be the Contractor's responsibility to provide structural, ductwork, electrical, service clearances, or other changes required to accommodate the substituted equipment. Changes shall be made at no additional cost to the Owner.
2. The Contract Drawings are intended to show the general arrangement of all mechanical work. They do not show in detail all offsets, fittings and transitions. Examine Drawings, investigate site conditions to be encountered and arrange work accordingly. Furnish all offsets and transitions required.
3. Drawings do not indicate in detail exact configuration of connections for fixtures, equipment and accessories. Final connection shall be as shown on approved Manufacturer's Submittal Drawings. Where Manufacturer's Submittal Drawings conflict with the Contract Documents, confer with the Design Professional for resolution.
4. Measurement of Drawings by scale shall not be used as dimensions for fabrication. Measurements for locating fixtures, equipment, ductwork, piping and other mechanical items shall be made on the site and shall be based on actual job conditions.
5. Check space limitations and verify electrical requirements before ordering any mechanical equipment or materials. Place large equipment inside the building prior to the erection of exterior walls where equipment cannot enter finished building openings.

B. Coordination: Mechanical work shall be coordinated with that of other trades to avoid conflict. The Contractor shall study all plans and specifications for this project and shall notify the Design Professional of any conflict between work under Division 23 and work under other divisions of the Project. Particular attention shall be given to interference between piping, electrical installations, structural systems, building openings and ductwork.

C. Installation Instructions: Manufacturer's installation instructions for all equipment furnished under Division 23 shall be furnished by the Contractor. Instructions shall be maintained on the jobsite until the project is complete and then turned over to the Owner.

D. Operation and Maintenance (O&M) Manuals:
1. Provide an electronic (PDF format) document containing all of the operation and maintenance manuals for mechanical equipment utilized on the project as specified in this and other sections of the specifications.
2. The O&M document shall include a cover page indicating the project name, project number, lead design professional, mechanical design professional, and project owner.
3. The document shall include a table of contents with electronic tabs that link to each of the equipment sections in the document.
4. Project-specific model and serial number information shall be shown on the lead page of each equipment section in the manual.
5. The manual shall include documentation confirming registration of extended warranties (such as compressor warranties) with the equipment manufacturer. This documentation shall include equipment serial numbers and dates of warranty start.
6. The document shall be submitted to the owner and the design team at least 15 days prior to the scheduled systems/equipment maintenance training.

E. Operation and Maintenance Owner Training:
1. Training of the owner’s designated maintenance personnel shall be scheduled with the owner in advance.
2. The content of the training session or sessions shall cover essential operating and maintenance characteristics of all mechanical equipment installed under the project.
3. Upon completion of the training, the owner and design team shall be presented with a document indicating the date and location of the training, the general description of the training, and a list of the Owner’s staff that attended the training.

1.7 PERMITS

A. Obtain all necessary Permits and Inspections required for the installation of this work and pay all charges incident thereto. Deliver to the Design Professional all certificates of inspection issued by authorities having jurisdiction.

B. Sewer tap fees, water tap fees, meter fees, and all other charges for work under Division 23, including charges for meter installation and excess service by utilities shall be paid by the Contractor.

1.8 SAFETY

A. OSHA Requirements applicable to the project shall be complied with at all times.

B. Manufacturer's Safety Instructions shall be followed in all instances.

C. Asbestos Containing Materials (ACM) shall not be used on this project.

D. Refrigerants containing CFC's or HCFS's shall not be used on this project, nor shall any equipment using such refrigerants be incorporated into this project.

E. Electrical Equipment Clearances: Piping, equipment and other mechanical installations shall not be located within 42" of the front or 36" of the side of any electrical switchboards, panelboards, power panels, motor control centers, electrical transformers or similar electrical equipment. Piping and ductwork shall not pass through or above electrical equipment rooms except as required to serve those rooms.

F. Guards shall be provided where appliances, equipment, fans or other components that require service are located within 10 feet of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches above the floor, roof or grade below. The guard shall extend not less than 30 inches beyond each end of such appliances, equipment, fans, components and roof hatch openings and the top of the guard shall be located not less than 42 inches above the elevated surface adjacent to the guard. The guard shall be constructed so as to prevent the passage of a 21-inch diameter sphere and shall comply with the loading requirements for guards specified in the International Building Code.

1.9 PROTECTION OF MECHANICAL SYSTEMS AND COMPONENTS DURING CONSTRUCTION

A. Material storage:
   1. All materials and equipment stored on the jobsite shall be elevated above the ground and stored under suitable weather cover. Materials and equipment shall not be situated in areas subjected to localized flooding.
   2. Manufacturer's original shipping packaging and protective coverings shall be left in place until the equipment is prepared for installation.

B. Roof protection: All penetrations through roofs, including roof curbs, piping curbs and roof drainage system elements shall be properly protected during construction to prevent water intrusion into the building. Protective measures could include temporary covers and plugs, as well as other appropriate temporary elements.

C. Electrical enclosure protection:
   1. During construction, all protective covers and other devices shall be left in place that protect against inadvertent contact with live electrical circuits.
   2. All warning labels related to electrical and rotating equipment hazards shall be in place prior to energizing mechanical equipment circuits.

D. Protection of ducts and piping:
1. Maintain temporary closures on the ends of all ducts and pipes as the installation work progresses. Temporary closures include plastic sheeting, tape and appropriate caps and covers.
2. Where debris enters piping during installation, steps shall be taken to clean the interior of the pipe prior to placing it in service.
3. Where debris enters ductwork during installation the duct interior shall be cleaned prior to placing in service.

E. Operation of HVAC systems during construction:
1. Although the operation of the permanent HVAC systems during the construction process is strongly discouraged, the Contractor shall take measures to protect the systems from contamination if they are operated.
2. When placed in operation during the construction period, all HVAC systems shall have MERV 8 filtration in all standard filter racks throughout the systems. Where so equipped, final filter banks do not have to be in place.
3. All return and outdoor air intake openings shall be protected with MERV 8 filter material at all points of entry into the duct system. These protections shall be maintained and remain in place until the building is prepared for final inspection.
4. Prior to final acceptance of the building HVAC systems, the interior of all HVAC unit cabinets shall be thoroughly cleaned to “like-new” condition.

1.10 CODES AND STANDARDS

A. Mechanical installations shall conform to the current edition (recognized by the State) of the following, in addition to any previously mentioned Codes and Standards.
1. The International Building Code.
2. The International Mechanical Code.
3. The International Plumbing Code.
4. The International Fire Protection Code.
5. The State Energy Code.
6. NFPA Standard 70, National Electric Code.
7. NFPA Standard 90A, Installation of Air Conditioning and Ventilation Systems.
8. NFPA Standard 101, Code for Safety to Life for Fire in Buildings and Structures.

PART 2 – PRODUCTS Not required for this section.

PART 3 - EXECUTION Not required for this section.

END OF SECTION 23 00 00

DIVISION 23 - HVAC
SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

A. This Section includes the following basic mechanical materials and methods to complement other Division 23 Sections.
   1. Piping materials and installation instructions common to most piping systems.
   2. Concrete equipment base construction requirements.
   3. Equipment nameplate data requirements.
   4. Field-fabricated metal equipment supports.
   5. Installation requirements common to equipment specification Sections.
   6. Cutting and patching.
   7. Touchup painting and finishing.

B. Pipe and pipe fitting materials are specified in piping system Sections.

1.3 DEFINITIONS

A. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.

B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

F. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data for following piping specialties:
   1. Identification materials and devices.

C. Samples of color, lettering style, and other graphic representation required for each identification material and device.

D. Shop drawings detailing fabrication and installation for metal supports and anchorage for mechanical materials and equipment.

E. Prepare coordination drawings of Mechanical Rooms and Yards to a ¼-inch equals 1-foot scale or larger. Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Show where sequence and coordination of installations are important to the efficient flow of the Work. Include the following:
   1. Proposed locations of piping, ductwork, equipment, and materials. Include the following:
      a. Planned duct systems layout, including elbow radii and duct accessories.
      b. Clearances for installing and maintaining insulation.
      c. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
      d. Equipment service connections and support details.
      e. Sizes and location of required concrete pads and bases.

1.5 QUALITY ASSURANCE

A. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

B. Where systems are configured such that they require field connection of piping, devices, and control wiring between system components (such as an outdoor condensing unit and an indoor air handling unit with refrigerant coils), the final installation shall form a fully functional system. All necessary components shall be furnished, installed, and properly commissioned in a manner that reliably achieves the specified Sequence of Operation and the manufacturer's published operational sequences.

C. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

D. Coordinate all electrical service requirements for mechanical equipment prior to the submittal of shop drawings. Confirm the compatibility of all power services with the equipment being furnished. Confirm compatibility of electrical lugs being provided by the equipment manufacturer with the power wiring being furnished under Division 26. Furnish written documentation that all characteristics have been coordinated with and confirmed by the electrical subcontractor.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

E. Coordinate connection of electrical services.

F. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

G. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces.

H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Refer to individual piping system specification Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual piping system specification Sections in Division 23 for special joining materials not listed below.

B. Solder Filler Metal: ASTM B 32.
1. Alloy Sn95 or Alloy Sn94: Tin (approximately 95 percent) and silver (approximately 5 percent), meeting NSF/ANSI 372 standard for “Lead Free”.

C. Brazing Filler Metals: AWS A5.8.
1. BCuP Series: Copper-phosphorus alloys.
2. BAg1: Silver alloy.

2.3 PIPING SPECIALTIES

A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
1. Steel Sheet-Metal: 24-gage or heavier galvanized sheet metal, round tube closed with welded longitudinal joint.
2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.

2.4 IDENTIFYING DEVICES AND LABELS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 23 Sections. Where more than one type is specified for listed application, selection is Installer's option but provide single selection for each product category.

B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped, permanently fastened to equipment.
1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
2. Location: An accessible and visible location.

C. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, conforming to ASME A13.1.

D. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white (letter color) melamine sub-core, except when other colors are indicated.
1. Fabricate in sizes required for message.
2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
3. Punch for mechanical fastening.
4. Thickness: 1/16 inch, except as otherwise indicated.
5. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.

E. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.
1. Multiple Systems: Where multiple systems of same generic name are indicated, provide identification that indicates individual system number as well as service such as "Boiler No. 3," "Air Supply No. 1H," or "Standpipe F12."

2.5 FIRE-STOPPING

A. Fire-Resistant Sealant: Provide UL Listed firestopping system for filling openings around penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

B. All products shall be applied in accordance with manufacturer’s UL-listed guidance.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS--COMMON REQUIREMENTS

A. General: Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 23 specify piping installation requirements unique to the piping system.

B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.

C. Install piping at indicated slope.

D. Install components having pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's printed instructions.

M. Install sleeves for pipes passing through concrete and masonry walls, concrete floor and roof slabs, exterior walls and where indicated.
1. Cut sleeves to length for mounting flush with both surfaces.
2. Build sleeves into new walls and slabs as work progresses.
3. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
   a. Steel Pipe Sleeves: For pipes smaller than 6 inches.
   b. Steel Sheet-Metal Sleeves: For pipes 6 inches and larger that penetrate gypsum-board partitions.

N. Above Grade, Exterior Wall, Pipe Penetrations: Seal penetrations using sleeves and elastomeric sealant. Size sleeve for ½-inch annular clear space between pipe and sleeve for installation of sealant.
1. Install steel pipe for sleeves smaller than 6 inches.
2. Install sheet metal sleeve assembly for sleeves 6 inches and larger.

O. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with U.L. Listed firestopping sealant system.

P. Verify final equipment locations for roughing in.

Q. Refer to equipment specifications in other Sections for roughing-in requirements.

R. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system Sections.
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Soldered Joints: Construct joints according to AWS "Soldering Manual," Chapter 22 "The Soldering of Pipe and Tube."
4. Brazed Joints: Construct joints according to AWS "Brazing Manual" in the "Pipe and Tube" chapter.

3.2 EQUIPMENT INSTALLATION--COMMON REQUIREMENTS

A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Design Professional.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.

D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

E. Install equipment giving right-of-way to piping systems installed at a required slope.

F. Equipment and appliances containing evaporators or cooling coils shall be installed with a means of condensate removal in compliance with IMC 307.2. A water level detection device conforming to UL 508 shall be provided for all main condensate pans and be interlocked to de-energize the unit's main fan should the drain pan water level exceed the main drainpipe connection level. Additional measures shall be taken where indicated on drawings or specifications.

3.3 LABELING AND IDENTIFYING

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
   1. Plastic markers, with application systems. Install on pipe insulation segment where required for hot non-insulated pipes.
   2. Locate pipe markers wherever piping is exposed in finished spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums), and exposed exterior locations as follows:
      a. Near each valve and control device.
      b. Near each branch, excluding short take-offs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.
      c. Near locations where pipes pass through walls, floors, ceilings, or enter inaccessible enclosures.
      d. At access doors, manholes, and similar access points that permit view of concealed piping.
      e. Near major equipment items and other points of origination and termination.
      f. Spaced at a maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
   3. On piping above removable acoustical ceilings, provide as noted in the previous paragraph, except omit intermediately spaced markers.

B. Equipment: Install engraved plastic laminate sign or equipment marker on or near each major item of mechanical equipment.
   1. Lettering Size: Minimum 1/4-inch -high lettering for name of unit where viewing distance is less than 2 feet, 1/2-inch -high for distances up to 6 feet, and proportionately larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 of size of principal lettering.
   2. Text of Signs: Provide text to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to name of identified unit.

C. Mark all above ceiling devices such as valves, fire dampers, pumps and HVAC equipment with signs located on the ceiling below.

D. Adjusting: Relocate identifying devices which become visually blocked by work of this Division or other Divisions.

3.4 PAINTING AND FINISHING

A. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

B. Paint all exposed steel surfaces of piping and supports with one coat of primer and two coats of enamel.

3.5 CONCRETE BASES

A. Construct concrete equipment bases of dimensions indicated, but not less than 4 inches larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive strength concrete with 6 x 6 x #10 reinforcing wire mesh. Outdoor concrete bases shall extend a minimum of 4" above grade and be a minimum thickness of 6".

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1 "Structural Welding Code--Steel."

3.7 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of the trades involved.

B. Repair cut surfaces to match adjacent surfaces.

END OF SECTION 23 05 00

DIVISION 23 - HVAC
SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes hangers and supports for mechanical systems piping and equipment.

1.3 DEFINITIONS

A. Terminology used in this Section is defined in MSS SP-90.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data for each type of hanger and support.

1.5 QUALITY ASSURANCE

A. Licensed Operators: Use operators that are licensed by powder-operated tool manufacturers to operate their tools and fasteners.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.
   1. Components include galvanized coatings or alternate rust preventing shop coating.

B. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

C. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

2.2 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36, steel plates, shapes, and bars, black and galvanized.

B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.

C. Washers: ASTM F 844, steel, plain, flat washers.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in the Section specifying the equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.2 HANGER AND SUPPORT INSTALLATION

A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.

C. Install supports with maximum spacings complying with MSS SP-69.

D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.

F. Install concrete inserts in new construction prior to placing concrete.

G. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.

H. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

K. Support all piping direct from structure and independent of other piping.

L. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

M. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.

O. Insulated Piping: Comply with the following installation requirements.
1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.
2. Shields: Install MSS Type 40, protective shields on insulated piping. Shields span an arc of 180 degrees and have dimensions in inches not less than the following:

NPS (Inches)	LENGTH (Inches)	THICKNESS (Inches)
1/4 to 3-1/2	12	0.048
4	12	0.060
5 and 6	18	0.060
8 to 14	24	0.075
16 to 24	24	0.105

3.3 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.

B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and 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. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.5 PAINTING

A. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

C. Paint all exposed steel surfaces with one coat of primer and two coats of enamel.

END OF SECTION 23 05 29

DIVISION 23 - HVAC
SECTION 23 05 48 - VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes vibration isolators, vibration isolation bases and vibration isolation roof curbs.

1.3 SUBMITTALS

A. Product Data: Indicate types, styles, materials, and finishes for each type of isolator specified. Include load deflection curves.

1.4 QUALITY ASSURANCE

A. All isolation deflections shall be based on ASHRAE 2023 Handbook - HVAC Applications, Chapter 49. The isolation of any mechanical equipment included in these plans that is not specifically covered by these specifications shall be isolated in accordance with Chapter 49, Table 47 as described above.

1.5 COORDINATION

A. Coordinate layout and installation of vibration isolation devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

PART 2 - PRODUCTS

2.1 ISOLATOR TYPES

A. Type 10, Suspended Equipment, Piping, Ductwork:
   1. Vibration Isolators shall consist of a steel spring and neoprene element in series mounted in a stamped or welded steel bracket for insertion into the hanger rod assembly.
   2. The elastomer insert shall be neoprene, molded from oil resistant compounds and shall be color coded to indicate load capacity and selected to operate within its published load range.
   3. The steel spring shall consist of large diameter laterally stable steel springs assembled into formed or welded steel housing assemblies designed to limit Springs shall have a lateral stiffness greater than 0.8 times the rated vertical stiffness and shall be designed to provide up to 50% overload capacity.
   4. The steel bracket shall be fabricated from steel and provided with a corrosion resistance finished. The hanger bracket shall be designed to carry a 500% overload without failure and to allow a support rod misalignment through a 30-degree arc without metal-to-metal contact or other short circuit. The hanger bracket shall incorporate spring caps with indexed steps, which correspond to the washer diameter of the hanger rod to keep the rod centered in the spring cap.

PART 3 - EXECUTION

3.1 INSTALLATION

A. If the equipment provided is not furnished with integral structural steel supports, mounting feet or lifting lugs, the contractor shall provide miscellaneous steel shapes as required to install or suspend the equipment and attach the vibration isolation devices as specified herein.

B. Support steel shall include but not be limited to rails, brackets, angles, channels, and similar components.

C. All equipment specified to be isolated shall be installed and isolators shall be attached to the building structure or floor and the vibration isolators shall be adjusted and leveled so that the vibration isolators are performing properly.

D. All vibration isolation products, flexible pipe connectors and sound control products shall be installed as outlined in the manufacturer's printed installation instructions.

E. Fill concrete inertia bases, after installing base frame, with 3000-psig concrete, and trowel to a smooth, hard finish.

F. Install pipe isolation connectors at connections for equipment supported on vibration isolators. Install isolation hangers on the first three piping supports adjacent to vibration producing equipment (i.e. air handling units, pumps, etc.).

3.2 VIBRATION ISOLATION CERTIFICATE OF COMPLIANCE

A. The manufacturer's representative shall be responsible for providing such assistance and supervision as necessary to assure a correct installation and adjustment of vibration isolation products.

B. The manufacturer's representative shall visit the installation once all installed items have been completed but prior to the installation of ceilings or walls that may conceal any devices and inspect the installation for compliance with the manufacturer's installation instructions. Upon satisfaction that all devices are installed correctly, and systems are isolated properly, the representative shall submit a written report outlining the installation as in compliance with these specifications and the manufacturer's installation instructions.

3.3 VIBRATION ISOLATION SCHEDULE FOR MECHANICAL SYSTEMS

Equipment Type	Isolator	Base	Deflection
Suspended Air Handling Units	Type 10	None	1.0"

END OF SECTION 23 05 48

DIVISION 23 - HVAC
SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:
   1. Balancing airflow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
   2. Adjusting total HVAC systems to provide indicated quantities.
   3. Measuring electrical performance of HVAC equipment.
   4. Setting quantitative performance of HVAC equipment.
   5. Verifying that automatic control devices are functioning properly.
   6. Reporting results of the activities and procedures specified in this Section.

B. Related Sections include the following:
   1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.
   2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of a system or equipment.

L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

M. AABC: Associated Air Balance Council.

N. AMCA: Air Movement and Control Association.

O. NEBB: National Environmental Balancing Bureau.

P. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.4 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.

B. Certified Testing, Adjusting, and Balancing Reports: Submit reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

1.5 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by either AABC or NEBB.

B. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:
1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.
3. Certify that the Agent has either tested and balanced systems according to the Contract Documents or that systems are balanced to optimum performance capabilities within design and installation limits.

C. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

D. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards or in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

E. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

F. Test and balance process is not deemed as accepted until a complete report is received free of deficiencies and discrepancies and approved in writing by the Engineer.

1.6 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on air distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
2. Verify that balancing devices are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine project record documents.

D. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

F. Examine system and equipment test reports.

G. Examine HVAC system and equipment installations to verify that indicated balancing devices are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

H. Review manufacturer’s certification for each piece of HVAC equipment to be tested. Test and balance shall not be performed until certification letters have been obtained.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

L. Examine equipment for installation and for properly operating safety interlocks and controls.

M. Examine automatic temperature system components to verify the following:
1. Dampers and other controlled devices operate by the intended controller.
2. Dampers are in the position indicated by the controller.
3. Integrity of dampers for free and full operation and for tightness of fully closed and fully open positions.

4. Thermostats and sensors are located to avoid adverse effects of sunlight, drafts, and cold walls.
5. Sensors are located to sense only the intended conditions.
6. Sequence of operation for control modes is according to the Contract Documents (including fan controls).
7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
8. Interlocked systems are operating.
9. Changeover from heating to cooling mode occurs according to design values.

N. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:
1. Permanent electrical power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.
5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
6. Windows and doors can be closed so design conditions for system operations can be met.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" or AABC National Standards and this Section.

B. Cut insulation, ducts and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

3.5 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES

A. The procedures in this Article apply to constant-volume supply-, return-, and exhaust-air systems.

B. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.
   1. Measure fan static pressures to determine actual static pressure as follows:
      a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
      b. Measure static pressure directly at the fan outlet or through the flexible connection.
      c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
      d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
   2. Measure static pressure across each air-handling unit component.
      a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
   3. Measure static pressures entering and leaving other devices such as duct silencers under final balanced conditions.
   4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
   5. Adjust fan speed higher or lower than design with the approval of the Design Professional. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
   6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.
   1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
      a. Where sufficient space in submains and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
   2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design airflows within specified tolerances.

D. Measure terminal outlets and inlets without making adjustments.
   1. Measure terminal outlets using standard measurement practices.

E. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.
   1. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.
   2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 HEAT-TRANSFER COILS

A. Dx Coils: Measure the following data for each coil:
   1. Dry-bulb temperatures of entering and leaving air.
   2. Wet-bulb temperatures of entering and leaving air (for cooling coils).
   3. Airflow.
   4. Air pressure drop.

B. Electric-Heating Coils: Measure the following data for each coil:
   1. Nameplate data.
   2. Airflow.
   3. Entering- and leaving-air temperatures at full load.
   4. Voltage and amperage input of each phase at full load and at each incremental stage.
   5. Calculated kW at full load.
   6. Fuse or circuit-breaker rating for overload protection.

3.7 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans: Plus 5 to plus 10 percent.
   2. Air Outlets and Inlets: Minus 10 percent to plus 10 percent.

3.8 FINAL REPORT

A. General: Electronic (PDF) format, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of document signed and sealed by the certified testing and balancing engineer.
   1. Include a list of the instruments used for procedures, along with proof of calibration.
   2. Include letters from HVAC equipment manufacturers certifying that each piece of equipment has been installed and commissioned in accordance with manufacturer’s recommendations.

C. Final Report Contents: In addition to the certified field report data, include the following:
   1. Fan curves.
   2. Manufacturers' test data.
   3. Field test reports prepared by system and equipment installers.
   4. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

3.9 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: Perform testing, adjusting, and balancing procedures during near-peak summer (above 85ºF) and during near-peak winter conditions (below 40ºF.) Retainage may be held until each season has been tested. Refer to contract documents.

END OF SECTION 23 05 93

DIVISION 23 - HVAC
SECTION 23 07 00 – HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

A. This Section includes pipe, duct, and equipment insulation.

1.3 DEFINITIONS

A. Hot Surfaces: Normal operating temperatures of 100 deg F or higher.

B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.

C. Cold Surfaces: Normal operating temperatures less than 75 deg F.

D. Thermal resistivity is designated by an R-value that represents the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivity (R-value) is expressed by the temperature difference in degrees Fahrenheit between the two exposed faces required to cause 1 BTU per hour to flow through 1 square foot at mean temperatures indicated.

E. Thermal Conductivity (k-value): Measure of heat flow through a material at a given temperature difference; conductivity is expressed in units of Btu x inch/h x sq. ft. x deg F.

F. Density: Is expressed in lb./cu.ft.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract.

B. Product data for each type of mechanical insulation identifying k-value, thickness, and accessories. Provide a summary in schedule form of intended insulation material, jacket type, thickness and adhesive type for each pipe, duct or equipment using manufacturer’s nomenclature.

1.5 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
   1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
   2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

1.6 SEQUENCING AND SCHEDULING

A. Schedule insulation application after testing of piping and duct systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Glass Fiber:
      a. CertainTeed Corporation
      b. Knauf Fiberglass GmbH
      c. Manville
      d. Owens-Corning Fiberglas Corporation
      e. USG Interiors, Inc. - Thermafiber Division
   2. Flexible Elastomeric Cellular:
      a. Armaflex; Armacell LLC
      b. K-Flex; Nomaco K-Flex Corporation
      c. Aerocel; Aeroflex USA, Inc.

2.2 GLASS FIBER

A. Material: Inorganic glass fibers, bonded with a thermosetting resin.

B. Jacket: All-purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.

C. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets.
   1. Thermal Conductivity: 0.32 Btu x inch/h x sq. ft. x deg F average maximum, at 75 deg F mean temperature.
   2. Density: 3/4 pcf minimum within building envelope.
   3. Density: 1 pcf minimum exterior to building envelope.

D. Adhesive: Produced under the UL Classification and Follow-up service.
   1. Type: Non-flammable - solvent-based.
   2. Service Temperature Range: Minus 20 to 180 deg F.

E. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.3 FLEXIBLE ELASTOMERIC CELLULAR

A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.
   1. Tubular Materials: ASTM C 534, Type I.
   2. Sheet Materials: ASTM C 534, Type II.

B. Thermal Conductivity: 0.25 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F.

C. Coating: Water based latex enamel coating recommended by insulation manufacturer.

D. Fire Performance Characteristics: Provide material having the following fire performance characteristics as determined by UL in accordance with ASTM Standard E84:
   1. Flame Spread = 25
   2. Smoke Developed = 50

2.4 CALCIUM SILICATE

A. Material ASTM C 533, Type 1: inorganic hydrous calcium silicate, non-asbestos fibrous reinforcement; incombustible.

B. Form: Molded flat block, curved block, grooved block, and performed pipe sections as appropriate for surface.

C. Thermal Conductivity: 0.60 Btu x inch/h x sq. t. x deg F at 500 deg F.

D. Dry Density: 15.0 pcf maximum.

E. Compressive Strength: 60 psi minimum at 5 percent deformation.

F. Fire Performance Characteristics: Provide materials identical to those whose fire performance characteristics have been determined, per test method indicated below, by UL or other testing and inspecting organization acceptable to authorities having jurisdiction.
1. Test Method: ASTM E 84
2. Flame Spread: 0
3. Smoke Developed: 0

2.5 INSULATING CEMENTS

A. Mineral Fiber, Hydraulic-Setting Insulating and Finishing Cement: ASTM C 449.

B. Thermal Conductivity: 1.2 Btu x inch/h x sq. ft. x deg F average maximum at 400 deg F mean temperature.

C. Compressive Strength: 100 psi at 5 percent deformation.

2.6 ADHESIVES

A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.

B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:
1. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.
2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.7 JACKETS

A. General: ASTM C 921, Type 1, except as otherwise indicated.

B. Foil and Paper Jacket: Laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
1. Water Vapor Permeance: 0.02 perm maximum, when tested according to ASTM E 96.
2. Puncture Resistance: 50 beach units minimum, when tested according to ASTM D 781.

2.8 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, pre-sized a minimum of 8 ounces per sq. yd.
1. Tape Width: 3 inches.
2. Cloth Standard: MIL-C-20079H, Type I.
3. Tape Standard: MIL-C-20079H, Type II.

B. Glass Fiber Reinforcing Mesh (Glassfab): High-strength, open weave, resin-treated, fiberglass reinforcing reinforcement of coatings.
1. 10 strands x 10 strands per sq. in.
2. Minimum 1.8 ounces per sq. yd.

C. Wire: 14 gage nickel copper alloy, 16 gage, soft-annealed stainless steel, or 16 gage, soft-annealed galvanized steel.

D. Corner Angles: 28-gage, 1-inch by 1-inch aluminum, adhered to 2-inches by 2-inches kraft paper.

E. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.9 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition.
   1. Water Vapor Permeance: 0.15 perm maximum.
   2. Temperature Range: Minus 20 to 180 deg F.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

B. Mix insulating cements with clean potable water.
   1. Follow cement manufacturer's printed instructions for mixing and portions.

3.2 INSTALLATION, GENERAL

A. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.

B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

C. Install vapor barriers on insulated pipes, ducts, and equipment having surface operating temperatures below 60 deg F.

D. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

E. Install insulation with smooth, straight, and even surfaces.

F. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.

G. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.

H. Seal Ends: Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.

I. Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.

J. Keep insulation materials dry during application and finishing.

K. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:
   1. Fibrous glass ducts.
   2. Factory-insulated flexible ducts.
   3. Factory-insulated plenums, casings, terminal boxes and filter boxes and sections.
   4. Flexible connectors for ducts and pipes.
   5. Vibration control devices.
   6. Testing laboratory labels and stamps.
   7. Nameplates and data plates.
   8. Pre-insulated access panels and doors in air distribution systems.
   9. Sanitary drainage and vent piping. (Drainage piping receiving air conditioning condensate shall be insulated.)

3.3 PIPE INSULATION INSTALLATION, GENERAL

A. Tightly butt longitudinal seams and end joints. Bond with adhesive.

B. Stagger joints on double layers of insulation.

C. Apply insulation continuously over fittings, valves, and specialties, except as otherwise indicated.

D. Apply insulation with a minimum number of joints.

E. Apply insulation with integral jackets as follows:
1. Pull jacket tight and smooth.
2. Cover circumferential joints with butt strips, at least 3 inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.
3. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.
4. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.
5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.
6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

F. Wall and Partition Penetration: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions. Where materials transition due to differences in interior/exterior specifications, transition shall occur at exterior wall surface.

G. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire-rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with a U.L. Listed firestopping or fire-resistant joint sealer.

3.4 FLEXIBLE ELASTOMERIC CELLULAR PIPE INSULATION INSTALLATION

A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.

B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.
1. Miter cut materials to cover soldered elbows and tees.
2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.5 DUCT INSULATION

A. Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:
1. Smaller Than 24-Inches: Bonding adhesive applied in 6 inches wide transverse strips on 12-inches centers.
2. 24-Inches and Larger: Anchor pins spaced 12 inches apart each way. Apply bonding adhesive to prevent sagging of the insulation.
3. Overlap joints 3 inches.
4. Seal joints, breaks, and punctures with vapor barrier compound and glass tape (glasfab and mastic).

3.6 JACKETS

A. Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2 inches laps at longitudinal joints and 3-inch-wide butt strips at end joints.
   1. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound (mastic) and glass tape (glassfab).

3.7 FINISHES

A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed exterior insulation.

3.8 APPLICATIONS

A. General: Materials and thicknesses are specified in schedules at the end of this Section.

B. Piping Systems: Unless otherwise indicated, insulate the following piping systems:
   1. Interior air conditioning condensate drains and sanitary P-traps receiving air conditioning condensate.
   2. Refrigerant suction and hot gas piping.

C. Duct Systems: Unless otherwise indicated, insulate the following duct systems:
   1. Supply, return and outside air ductwork.
   2. Above-ceiling surfaces of all air devices except where pre-insulated.

3.9 PIPE INSULATION SCHEDULES

A. General: Furnish insulation vapor barrier on all piping carrying fluids below 60ºF.

B. Schedules:
   1. Refrigerant Suction and Hot Gas Piping: 3/4" flexible elastomeric insulation. Paint exterior insulation with two coats of manufacturer recommended coating or polymeric pipe covering as recommended by the manufacturer.
   2. Air Conditioning Condensate Drain Piping: 3/8" flexible elastomeric insulation (interior applications only).

3.10 DUCTWORK AND PLENUM INSULATION SCHEDULES

A. General: Furnish vapor barrier on all ductwork insulation.

B. Schedules:
   1. Supply, return, and outdoor air ductwork:
      a. Lined and unlined within building insulation envelope: 2" glass fiber blanket. Seal all joints and penetrations in jacket with glasfab and mastic.

END OF SECTION 23 07 00

DIVISION 23 - HVAC
SECTION 23 09 00 - CONTROLS SYSTEM EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components.

B. Related Section: Division 23 Section "Sequence of Operation" contains requirements that relate to this Section.

1.3 SYSTEM DESCRIPTION

A. Control system consists of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories connected to controllers to operate mechanical systems according to sequences of operation indicated or specified.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data for each type of product specified. Include manufacturer's technical Product Data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, installation instructions, and startup instructions.

C. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

D. Shop Drawings containing the following information for each control system:
1. Diagrams for all required electrical wiring. Clearly differentiate between factory-installed and field-installed wiring.

E. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer specializing in control system installations.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing control systems similar to those indicated for this Project and that have a record of successful in-service performance.

C. Comply with NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store equipment and materials inside and protected from weather

PART 2 - PRODUCTS

2.1 ROOM THERMOSTATS

A. Wi-Fi Programmable (Smart) Thermostat Controllers: Wi-fi communication capable programmable thermostat with OFF-HEAT-AUTO-COOL-EM.HT mode control and AUTO-ON fan control in a wall-mounted enclosure equipped with a touch-screen for input control. Provide 7-day scheduling capability for setback control. Unit shall be field-configurable for multi-stage cooling or heating and strip heat control (2C/3H minimum) as required for unit control. Control shall be proportional plus integral with adaptive/learning technology and automatic changeover. Manufacturer shall provide and maintain a free, no-subscription, iOS and Android applications for viewing and controlling thermostats remotely.
   1. Furnish with the following:
      a. Outside air damper/ventilation control.
      b. Optimal start control.
      c. Humidity control capability compatible with hot liquid reheat systems

B. Room Thermostat Accessories: As follows:
   1. Insulating Bases: For thermostats located on exterior walls.

2.2 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or 2-position action.
   1. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
   2. Spring-Return Motors for Dampers Larger than 25 sq. ft.: Size for running and breakaway torque of 150 inch-pounds.

2.3 DAMPERS

A. Dampers: AMCA-rated, parallel or opposed blade design; form frames from not less than 0.1084-inch galvanized steel with mounting holes for duct mounting; damper blades not less than 0.0635-inch galvanized steel, with maximum blade width of 8 inches.
   1. Blades secured to 1/2-inch diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass. Ends sealed against spring-stainless-steel blade bearings. Thrust bearings at each end of every blade.
   2. Operating Temperature Range: From -40 to 200 deg F.
   3. For standard applications as indicated, (as selected by manufacturer's sizing techniques) with optional closed-cell neoprene edging.
   4. For low-leakage applications (outdoor air) as indicated, provide parallel or opposed blade design (as selected by manufacturer's sizing techniques) with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm/sq. ft. of damper area, at differential pressure of 4 inches wg when damper is being held by torque of 50 inch-pounds; test in accordance with AMCA 500.

2.4 RELAYS

A. Control relays shall be UL listed plug-in type with dust cover. Contract rating, configuration and coil voltage suitable for application.

2.5 TRANSFRMERS AND POWER SUPPLIES

A. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.

B. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.

C. Unit shall operate between 0 c and 50 c.

D. Unit shall be UL recognized.

2.6 CONTROL CABLE

A. Electronic Cable for Control Wiring: Refer to Division 26 Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field end devices and wiring are installed before proceeding with installation.

3.2 INSTALLATION

A. Install equipment as indicated to comply with manufacturer's written instructions.

B. Install software in control units and FMS server. Implement all features of programs to specified requirements and appropriate to sequence of operation.

C. Connect and configure equipment and software to achieve the sequence of operation specified.

D. Verify location of thermostats and other exposed control sensors with plans and room details before installation.
1. Install wall-mounted thermostats 4'-0" A.F., unless indicated otherwise. Coordinate mounting height with Architect.
2. Install wall-mounted thermostats minimum 8" away from door or window frames. Coordinate location with switches and other devices provided under other Divisions.

E. Install damper motors on outside of duct in warm areas, not where exposed to outdoor temperatures.

F. Install labels and nameplates to identify control components according to Division 23 Sections specifying mechanical identification.

3.3 ELECTRICAL WIRING AND CONNECTIONS

A. Install raceways, boxes, and cabinets according to Division 26.

B. Install building wire and cable according to Division 26.

C. Install signal and communication cable according to Division 26.
1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Except as indicated below, route all wiring in plenum rated cable secured to the structure.
3. All wiring associated with smoke detectors, smoke dampers, fire alarm shutdowns and similar systems shall be routed in conduit.
4. Bundle and harness multi-conductor instrument cable in place of single cables where a number of cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, neatly along hinge side; protect against abrasion. Tie and support conductors neatly.
6. Number-code or color-code conductors, except local individual room controls, for future identification and servicing of control system.

D. Connect electrical components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

E. Make electrical connections to power supply and electrically operated meters and devices.

F. Where not indicated otherwise, obtain power for control units from the nearest un-switched receptacle circuit.

3.4 COMMISSIONING

A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to start control systems.

B. Test and adjust controls and safeties.

C. Replace damaged or malfunctioning controls and equipment.

D. Start, test, and adjust control systems.

E. Demonstrate compliance with requirements.

F. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

3.5 DEMONSTRATION

A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to demonstrate and train Owner's maintenance personnel as specified below.
   1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
   2. Schedule training with Owner with at least 7 days' notice.

END OF SECTION 23 09 00

DIVISION 23 - HVAC
SECTION 23 09 93 - SEQUENCE OF OPERATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes control sequences for HVAC systems.

B. Related Section: Division 23 Section "Control Systems Equipment" contains requirements that relate to this Section.

1.3 SAFETY AND RELIABILITY SYSTEMS

A. Auto Restart: All HVAC systems and equipment shall be configured such that normal operation is resumed after a power failure.

B. Dead Band: Where used to control both heating and cooling, zone thermostats shall be capable of providing a temperature dead band of at least 5ºF in accordance with ASHRAE standard 90.1.

1.4 UNITARY SYSTEMS

A. Heat Pump Units:
1. Units shall be controlled by room thermostats.
2. Runtime of the unit shall be scheduled by the programmable thermostat. During unoccupied mode, outside air damper shall be closed (where applicable.)
3. When unit is scheduled to run, the compressor, heat/cool reversing valve and supply fan shall energize in heating or cooling mode as required to satisfy the thermostat setpoint. The associated outdoor air damper shall open.
4. When the compressor is unable to meet the heating requirements, the auxiliary strip heat shall energize.
5. When equipped with hot gas or hot liquid reheat, unit shall operate in full cooling mode when room humidity setpoint is exceeded. Hot gas/liquid valve shall open to the coil as required to prevent overcooling.

1.5 HEATING, VENTILATION AND HUMIDIFICATION SYSTEMS

A. Electric Unit Heaters: When space temperature falls below thermostat setpoint, the unit fan and heating coils shall energize.

B. Fans: See fan schedule.
1. Where fans are indicated to be interlocked with room lighting, furnish starters/contactors as required for control operation.
2. Exhaust Fan: Where exhaust fan serves more than a single space; provide a line voltage relay for each room and connect relays in parallel so that turning lights on in any room will start exhaust fan.

1.6 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Shop Drawings showing operating sequences of various equipment, devices, components, and materials included in the Text and defining the components' contribution to the system.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 23 09 93

DIVISION 23 - HVAC
SECTION 23 23 00 - REFRIGERANT PIPING AND CONDENSATE DRAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications, including pipes, tubing, fittings, and specialties; special-duty valves; and refrigerants. It also includes piping used for air conditioning condensate drainage.
   1. Division 23 Section "HVAC Insulation" for pipe insulation.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data for each valve type and refrigerant piping specialty specified.

C. Drawings showing layout of refrigerant piping, specialties, and fittings, including pipe and tube sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and equipment.
   1. Refrigerant piping indicated is schematic only. Size and design the layout and installation of the piping, including oil traps, double risers, specialties, and pipe and tube sizes, to ensure proper operation and conformance with warranties of connected equipment.

D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.

E. Maintenance data for refrigerant valves and piping specialties to include in the operation and maintenance manual.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with provisions of the following codes:
   1. ASME B31.5, "Refrigeration Piping."
   2. ASHRAE 15, "Safety Code for Mechanical Refrigeration."

B. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Nonelectrical"; or UL 429, "Electrically Operated Valves."

C. Listing and Labeling: Provide products specified in this Section that are UL listed and labeled.

D. Refrigerant pipe sizes indicated on the drawings are for estimating purposes only. Exact pipe sizes, configuration, and accessories required shall be determined by the equipment manufacturer based on field-obtained measurements and the requirements of the equipment connected to the piping. The completed installation shall form a fully functional system meeting the performance requirements of the Documents.

PART 2 - PRODUCTS

2.1 PIPES AND TUBES

A. Copper Tube: ASTM B 280, Type ACR (Type K soft and Type L hard).

B. Copper Tube: ASTM B 88, Type L hard.

2.2 PIPE AND TUBE FITTINGS

A. Copper Fittings: ASME B16.22, wrought copper, streamlined pattern.

2.3 JOINING MATERIALS

A. Brazing Filler Metals: AWS A5.8, Classification BAg-1 (Silver).

B. Solder: ASTM B 32, Alloy Sn95, Sn94, or E; lead free.

2.4 REFRIGERANT PIPING SPECIALTIES

A. Moisture/Liquid Indicators: 500-psig operating pressure, 200 deg F operating temperature; forged-brass body, with replaceable, polished, optical viewing window with color-coded moisture indicator, and solder-end connections.

B. Permanent Filter-Dryer: 500-psig maximum operating pressure, 225 deg F maximum operating temperature; steel shell and wrought-copper fittings for solder-end connections; molded-felt core surrounded by desiccant. Provide bi-directional dryer for heat pump systems.

2.5 REFRIGERANT

A. Lower-GWP refrigerants (R-32 or R-454B).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for compliance with requirements for installation tolerances and other conditions affecting performance of refrigerant piping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Aboveground refrigerant piping: Type ACR copper tubing (Type L hard) with brazed joints.

B. Aboveground condensate drain piping: Type L copper tubing with soldered joints. Externally insulate for indoor applications.

3.3 INSTALLATION

A. Install refrigerant piping according to ASHRAE 15.

B. Provide all refrigerant piping and specialties sized and configured in accordance with the equipment manufacturer’s requirements. Provide the equipment manufacturer with field measurements for piping. The completed installation shall form a fully functional system meeting the project requirements.

C. Basic piping installation requirements are specified in other Division 23 sections.

D. Install piping in short and direct arrangement, with minimum number of joints, elbows, and fittings.

E. Arrange piping to allow normal inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.

F. Install piping with adequate clearance between pipe and adjacent walls and hangers, or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

G. Insulate refrigerant suction lines and hot gas lines. Insulate all refrigerant lines on inverter-driven split systems and variable refrigerant flow system.
   1. Do not install insulation until system testing has been completed and all leaks have been eliminated.

H. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.

I. Slope refrigerant piping as follows:
   1. Install horizontal hot-gas discharge piping with a uniform slope of 0.4 percent downward away from compressor.
   2. Install horizontal suction lines with a uniform slope of 0.4 percent downward to compressor.
   3. Install traps and double risers where indicated or where required to entrain oil in vertical runs.
   4. Liquid lines may be installed level.

J. Use fittings for changes in direction and branch connections.

K. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

L. Reduce pipe sizes using eccentric reducer fittings installed with level side down.

M. Install refrigerant valves according to manufacturer's written instructions.

N. When brazing, remove solenoid-valve coils; remove sight glasses; and remove stems, seats, and packing of valves, and accessible internal parts of refrigerant specialties. Do not apply heat near bulb of expansion valve.

O. Electrical wiring for solenoid valves is provided under Division 23 and specified in Division 26 Sections. Coordinate electrical requirements and connections.

P. Mount thermostatic expansion valves in any position, close to evaporator.
   1. Where refrigerant distributors are used, mount directly on expansion-valve outlet.
   2. Install valve so diaphragm case is warmer than bulb.
   3. Secure bulb to clean, straight, horizontal section of suction line using 2 bulb straps. Do not mount bulb in a trap or at the bottom of the line.
   4. Where external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

Q. Install pressure relief valves as required by ASHRAE 15. Pipe pressure relief valves on receivers to outdoors.

R. Charge and purge systems, after testing, and dispose of refrigerant following ASHRAE 15 procedures.

S. Charge system per industry accepted standards for systems utilizing refrigerant, or Manufacturer’s recommended procedures if more stringent than industry standards. The following is an outline of the triple evacuation method.
   1. Pull initial vacuum on the line set testing for a leak. If it holds then pressure test with Nitrogen at 300 psi minimum.
   2. Pump system down, recharge with Nitrogen to 2 psi. Perform this step two times.
   3. Pump system down, re-pressurize with Nitrogen and then evacuate system to 500 microns. Hold for 30 minutes.
   4. Break vacuum with refrigerant and charge per manufacturer’s directions.

3.4 HANGERS AND SUPPORTS

A. General: Hangers, supports, and anchors are specified in Division 23 sections. Provide according to ASME B31.5 and MSS SP-69.

B. Horizontal runs: Support by a trapeze constructed of strut channel.

C. Support vertical runs with strut channel anchored to wall or other structure.

D. Clamp all piping independently to the strut channel with appropriate clamping devices. At the clamping point, provide either an insulated saddle or continuous insulation with a sheet metal sleeve.

E. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes. Tube sizes are nominal or standard tube sizes as expressed in ASTM B 88.
1. 1/2 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. 5/8 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. 1 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.
4. 1-1/4 Inches: Maximum span, 72 inches; minimum rod size, 1/4 inch.
5. 1-1/2 Inches: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. 2 Inches: Maximum span, 96 inches; minimum rod size, 3/8 inch.
7. 2-1/2 Inches: Maximum span, 108 inches; minimum rod size, 3/8 inch.
8. 3 Inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
9. 4 Inches: Maximum span, 12 feet; minimum rod size, 1/2 inch.

F. Support vertical runs at each floor.

3.5 PIPE JOINT CONSTRUCTION

A. Basic pipe and tube joint construction is specified in Division 23 Sections.

B. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent formation of scale.

3.6 VALVE INSTALLATIONS

A. Install refrigerant valves according to manufacturer's written instructions.

B. Provide thermal expansion valve (TXV) or electronic expansion valve (EEV) on all systems:
1. For pressure type distributors, externally equalized with stainless steel diaphragm, and same refrigerant in thermostatic elements as in system.
2. Size valves to provide full rated capacity of cooling coil serviced. Coordinate selection with evaporator coil and condensing unit.
3. Install valves in accordance with equipment and valve manufacturer’s instructions.

C. Install pressure-regulating and relief valves as required by ASHRAE 15.

3.7 SPECIALTIES APPLICATION AND INSTALLATION

A. Install liquid indicators in liquid line leaving condenser, in liquid line leaving receiver, and on leaving side of liquid solenoid valves.

B. Install filter-dryers in liquid line adjacent to receivers, coils and before each solenoid valve.

3.8 CONNECTIONS

A. Electrical: Conform to applicable requirements of Division 26 Sections for electrical connections.

3.9 FIELD QUALITY CONTROL

A. Inspect and test refrigerant piping according to ASME B31.5, Chapter VI.
1. Pressure test with nitrogen per accepted industry practices using soap bubbles or electronic leak detector. Test to no leakage.

B. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

C. Repair leaks using new materials; retest.

3.10 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat requirements. Adjust hot gas/liquid bypass valve for proper unloading.

3.11 COMMISSIONING

A. Charge system per industry accepted standards for systems utilizing R-410A, or manufacturer's recommended procedures if more stringent than industry standards. The following is an outline of the triple evacuation method.
   1. Pull initial vacuum on the line set testing for a leak. If it holds then pressure test with Nitrogen at 300 psi minimum.
   2. Pump system down, recharge with Nitrogen to 2 psi. Perform this step two times.
   3. Pump system down, re-pressurize with Nitrogen and then evacuate system to 500 microns. Hold for 30 minutes.
   4. Break vacuum with refrigerant and charge per manufacturer's directions.

END OF SECTION 23 23 00

DIVISION 23 - HVAC
SECTION 23 31 13 - METAL DUCTWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract apply to this Section.

B. Related Sections: The following sections contain requirements that relate to this Section:
1. Division 23 Section "Duct Accessories" for flexible duct materials, dampers, duct-mounted access panels and doors, turning vanes, duct silencers, fabric ducts, pre-insulated outdoor ductwork, and turning vanes.
2. Division 23 Section "HVAC Insulation" for external duct and plenum insulation.
3. Division 23 Section "Diffusers, Registers, Grilles and Louvers."
4. Division 23 Section "Control Systems Equipment" for automatic volume control dampers and operators.
5. Division 23 Section "Testing, Adjusting, and Balancing."

1.2 SUMMARY

A. This Section includes rectangular and round metal ducts and plenums for heating, ventilating, and air conditioning systems in pressure classes from minus 4 inches to plus 10 inches water gage.

1.3 DEFINITIONS

A. Sealing Requirements Definitions: For the purposes of duct systems sealing requirements specified in this Section, the following definitions apply:
1. Seams: A seam is defined as joining of two longitudinally (in the direction of airflow) oriented edges of duct surface material occurring between two joints. All other duct surface connections made on the perimeter are deemed to be joints.
2. Joints: Joints include girth joints; branch and subbranch intersections; so-called duct collar tap-ins; fitting subsections; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum, and casing abutments to building structures.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. The duct system design, as indicated, has been used to select and size air moving and distribution equipment and other components of the air system. Changes or alterations to the layout or configuration of the duct system must be specifically approved in writing. Accompany requests for layout modifications with calculations showing that the proposed layout will provide the original design results without increasing the system total pressure.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract.

B. Product data including details of construction relative to materials, dimensions of individual components, profiles, and finishes for the following items:
1. Duct Liner.
2. Sealing Materials.

C. Record drawings including duct systems routing, fittings details, reinforcing, support, and installed accessories and devices

D. Maintenance data duct mounted devices.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant and fire-stopping materials to site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle sealant materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Sheet Metal, General: Provide sheet metal in thicknesses indicated, packaged and marked as specified in ASTM A 700.

B. Galvanized Sheet Steel: Lock-forming quality, ASTM A 527, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.

C. Reinforcement Shapes and Plates: Unless otherwise indicated, provide galvanized steel reinforcing where installed on galvanized sheet metal ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 DUCT LINER

A. General: Comply with NFPA Standard 90A.

B. Materials: ASTM C 1071, Type II, with coated surface exposed to airstream to prevent erosion of glass fibers.
   1. Thickness: 1 inch.
   2. Density: 1-1/2 pounds.
   3. Thermal Performance: "K-Factor" equal to 0.28 or better, at a mean temperature of 75 deg F.
   4. Fire Hazard Classification: Flame spread rating of not more than 25 without evidence of continued progressive combustion and a smoke developed rating of no higher than 50, when tested in accordance with ASTM C 411.
   5. Liner Adhesive: Comply with NFPA Standard 90A and ASTM C 916.
   6. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct. Provide fasteners that do not damage the liner when applied as recommended by the manufacturer, that do not cause leakage in the duct and will indefinitely sustain a 50-pound tensile deadload test perpendicular to the duct wall.
      a. Fastener Pin Length: As required for thickness of insulation, and without projecting more than 1/8 inch into the airstream.
      b. Adhesive for Attachment of Mechanical Fasteners: Comply with the "Fire Hazard Classification" of duct liner system.

2.3 SEALING MATERIALS

A. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for class 1 ducts.

B. Joint and Seam Sealant: One-part, non-sag, solvent-release-curing, polymerized butyl sealant complying with FS TT-S-001657, Type I; formulated with a minimum of 75 percent solids.

2.4 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials. Do not use powder actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.

B. Hangers: Galvanized sheet steel, or round, zinc plated steel, threaded rod.
   1. Hangers Installed in Corrosive Atmospheres: Electro-galvanized, all-thread rod or hot-dipped-galvanized rods with threads painted after installation.
   2. Straps and Rod Sizes: Conform with Table 4-1 in SMACNA HVAC Duct Construction Standards, 1995 Edition, for sheet steel width and gage and steel rod diameters.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes conforming to ASTM A 36.
   1. Where galvanized steel ducts are installed, provide hot-dipped-galvanized steel shapes and plates.

2.5 RECTANGULAR DUCT FABRICATION

A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards," Tables 1-3 through 1-19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.
   1. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
   2. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
   3. Square throat and round heel elbows shall not be used.

2.6 STATIC PRESSURE CLASSIFICATION

A. Static Pressure Classifications: Except where otherwise indicated, construct duct systems to the following pressure classifications:
   1. Low Pressure Supply Ducts: 1-inch water gage.
   2. Return Ducts: 1-inch water gage, negative pressure.
   3. Low Pressure Exhaust and Relief Ducts: 1-inch water gage, negative pressure.

B. Cross-breaking or Cross Beading: Cross-break or bead duct sides that are 19 inches and larger and are 20 gage or less, with more than 10 sq. ft. of unbraced panel area, as indicated in SMACNA "HVAC Duct Construction Standard," Figure 1-4, unless they are lined or are externally insulated.

2.7 RECTANGULAR DUCT FITTINGS

A. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard," 1995 Edition, Figures 2-1 through 2-10.

2.8 SHOP APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with 90 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness is prohibited.

B. Apply a coat of adhesive to liner facing in direction of airflow not receiving metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to assure butted edge overlapping.

E. Longitudinal joints in rectangular ducts shall not occur except at corners of ducts, unless the size of the duct and standard liner product dimensions make longitudinal joints necessary.

F. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely around perimeter; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

G. Secure transversely oriented liner edges facing the airstream with metal nosings that are either channel or "Z" profile or are integrally formed from the duct wall at the following locations:
1. Fan discharge.
2. Intervals of lined duct preceding unlined duct.

H. Terminate liner with duct buildouts installed in ducts to attach dampers, turning vane assemblies, and other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to the duct wall with bolts, screws, rivets, or welds. Terminate liner at fire dampers at connection to fire damper sleeve through fire separation.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

A. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification indicated.

B. Install ducts with the fewest possible joints.

C. Use fabricated fittings for all changes in directions, changes in size and shape, and connections.

D. Install couplings tight to duct wall surface with projections into duct at connections kept to a minimum.

E. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Provide clearance of 1 inch where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, if any.

H. Install insulated ducts with 1-inch clearance outside of insulation.

I. Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.

J. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

K. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

L. Non-Fire-Rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2 inches.

M. Low pressure supply duct takeoffs shall be equivalent to Crown 306 or equal by Flexmaster or United McGill. Medium pressure takeoffs shall be conical type.

N. Low pressure round duct runouts to supply diffusers may be "snap-lock" duct meeting the pressure classification.

3.2 SEAM AND JOINT SEALING

A. General: Seal duct seams and joints as follows:
   1. Conditioned Spaces:
      a. Supply duct pressure classification 2-inches water gage and greater and exhaust ducts: All transverse joints and longitudinal seams.
      b. Supply duct pressure classification less than 2-inches water gage and all return duct: All transverse joints and longitudinal seams.
      c. Return and Exhaust Duct: All transverse joints and longitudinal seams.
   2. Unconditioned Spaces:
      a. Supply duct pressure classification 2-inches water gage and greater: All transverse joints, longitudinal seams, and duct wall penetrations.
      b. Supply duct pressure classification less than 2-inches water gage and all return duct: All transverse joints, and longitudinal seams.
      c. Return and Exhaust Duct: All transverse joints.
   3. Outdoor Spaces:
      a. All supply and return duct: All transverse joints, longitudinal seams, and duct wall penetrations.
      b. Exhaust Duct: All transverse joints.

B. Solvent based sealant shall only be used in applications where freezing may occur before sealant is cured. Water-based sealant shall be used in all other applications.

C. Seal externally insulated ducts prior to insulation installation.

D. All duct sealing shall be in accordance with ASHRAE standard 90.1.

3.3 HANGING AND SUPPORTING

A. Install rigid round, rectangular, and flat oval metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards," Chapter 5.

B. Support horizontal ducts within 2-feet of each elbow and within 4-feet of each branch intersection.

C. Support vertical ducts at a maximum interval of 16 feet and at each floor.

D. Upper attachments to structures shall have an allowable load not exceeding 1/4 of the failure (proof test) load but are not limited to the specific methods indicated.

E. Install concrete insert prior to placing concrete.

F. Install powder actuated concrete fasteners after concrete is placed and completely cured.

3.4 CONNECTIONS

A. Equipment Connections: Connect equipment with flexible connectors in accordance with Division 23 Section "Duct Accessories."

B. Branch Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-7 and 2-8.

C. Outlet and Inlet Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-16 through 2-18.

D. Low pressure round supply duct takeoffs shall be equivalent to Crown 306 adjustable 45-degree takeoff. Other acceptable manufacturers include, but are not limited to, Flexmaster and United McGill.

3.5 FIELD QUALITY CONTROL

A. Disassemble, reassemble, and seal segments of the systems as required to accommodate leakage testing, and as required for compliance with test requirements.

B. All ductwork shall be approved by the Design Professional prior to the application of external insulation. In the absence of such approval, smoke testing, pressure testing or other leakage testing of ductwork shall be required.

C. Do not pressurize systems above the maximum design operating pressure (static pressure classification.) Give 7 days' advanced notice for testing.

D. Remake leaking joints as required and apply sealants to achieve specified maximum allowable leakage. Integrity of ductwork shall be approved by the Design Professional prior to application of insulation.

3.6 ADJUSTING AND CLEANING

A. Adjust volume control devices as required by the testing and balancing procedures to achieve required air flow. Refer to Division 23 Section "TESTING, ADJUSTING, AND BALANCING" for requirements and procedures for adjusting and balancing air systems.

B. Vacuum ducts systems prior to final acceptance to remove dust and debris.

END OF SECTION 23 31 13

DIVISION 23 - HVAC
SECTION 23 33 00 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Manual volume control dampers.
2. Fire dampers.
3. Turning vanes.
4. Duct-mounted access doors and panels.
5. Flexible connectors.
6. Flexible ducts.

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 23 Section "Diffusers, Registers, Grilles and Louvers" for diffusers, registers, and grilles.
2. Division 23 Section "Controls Systems Equipment" for HVAC control devices.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract.

B. Product data including details for materials, dimensions of individual components, profiles, and finishes for the following items:
1. Manual volume control dampers.
2. Fire dampers (if required).
3. Duct-mounted access panels and doors.
4. Flexible ducts.

C. Shop drawings from manufacturer detailing assemblies. Include dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection. Detail the following:
1. Special fittings and volume control damper installation (both manual and automatic) details.
2. Fire and smoke damper installations, including sleeves and duct-mounted access door and panel installations.

D. Product Certification: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static pressure loss, and dimensions and weights.

E. Maintenance data for volume control devices, fire dampers, and smoke dampers

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA Standards:
1. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."

B. U.L. Listing: Pre-insulated, outdoor ductwork shall meet U.L. 181, U.L. 723, and U.L. 94 Standards.

1.5 WARRANTY

A. General Warranty: The special warranty specified in this Article 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.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protect items from damage during shipping, storage and handling.

B. Where possible, store products inside and protect from weather. Where necessary to store outside, store above grade and enclose with a vented waterproof wrapping.

PART 2 - PRODUCTS

2.1 MANUAL VOLUME CONTROL DAMPERS

A. General: Provide factory-fabricated volume-control dampers, complete with required hardware and accessories. Stiffen damper blades to provide stability under operating conditions. Provide locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class. Provide end bearings or other seals for ducts with pressure classifications of 3 inches or higher. Extend axles full length of damper blades. Provide bearings at both ends of operating shaft.

B. Standard Volume Control Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside of air stream, and suitable for horizontal or vertical applications.
1. Steel Frames: Hat-shaped, galvanized-steel channels, minimum of 16 gage, and with mitered and welded corners. Provide frames with flanges where indicated for attaching to walls. Provide flangeless frames where indicated for installation in ducts.
2. Roll-Formed Steel Blades: 16-gage galvanized steel.
3. Blade Axles: Galvanized steel.
4. Tie Bars and Brackets: Galvanized steel.

C. Jackshaft: 1-inch-diameter, galvanized-steel pipe or 1/2" square galvanized bar stock rotating within a pipe bearing assembly mounted on supports at each mullion and at each end of multiple damper assemblies. Provide appropriate length and number of mountings to connect linkage of each damper of a multiple damper assembly. Cut groove in the end of the shaft parallel with damper blades.

D. Damper Control Hardware: Zinc-plated, die-cast core with a heavy-gage dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Provide center hole to suit damper operating rod size. Provide elevated platform for insulated duct mounting.

2.2 FIRE DAMPERS

A. General: UL labeled according to UL Standard 555 "Standard for Fire Dampers." Ratings shall be for dynamic system operation at 350º temperature.
1. Dampers used in low pressure systems shall be rated for 2000 fpm velocity and 4" wg pressure.
2. Dampers used in medium pressure systems (VAV supply and medium pressure exhaust) shall be rated for 3000 fpm and 8" wg pressure.

B. Fire Rating: 1-1/2 or 3 hours, as indicated by wall ratings on Architectural Plans.

C. Frame: Type B (blades outside airstream); fabricated with roll-formed, 21-gage, galvanized-steel; with mitered and interlocking corners. Furnish multi-blade dampers where required by code.

D. Mounting Sleeve: Factory-installed or field-installed galvanized steel.
   1. Minimum Thickness: 0.056-inch (16-gage) or 0.138-inch (10-gage) thick as indicated, and length to suit application.
   2. Exception: Furnish narrow frame damper without sleeve in applications where damper is mounted in rated partition behind supply/return register.

E. Mounting Orientation: Vertical or horizontal as indicated.

F. Blades: Roll-formed, interlocking, 21-gage galvanized steel. In place of interlocking blades, provide full-length, 21-gage, galvanized-steel blade connectors.

G. Fusible Link: Replaceable, 165 deg F rated.

2.3 TURNING VANES

A. Fabricate turning vanes according to SMACNA HVAC Duct Construction Standards, Figures 2-2 through 2-7.

2.4 DUCT-MOUNTED ACCESS DOORS AND PANELS

A. General: Provide construction and airtightness suitable for duct pressure class.

B. Frame: Galvanized sheet steel. Provide with bend-over tabs and foam gaskets.

C. Door: Double-wall, galvanized sheet metal construction with insulation fill and thickness, number of locks as indicated for duct pressure class. Provide vision panel where indicated. Provide cam latches.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber seals.

E. Insulation: 1-inch-thick fiber glass or polystyrene foam board.

2.5 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL Standard 181, Class 1.

B. Standard Metal-Edged Connectors: Factory-fabricated with a strip of fabric 3-1/2 inches wide attached to 2 strips of 2-3/4-inch-wide, 24-gage, galvanized sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected duct system. Fold and crimp metal edge strips onto fabric as illustrated in SMACNA HVAC Duct Standard, 3rd Edition, Figure 7-8.

C. Conventional, Indoor System Flexible Connectors Fabric: Glass fabric double coated with polychloroprene.
   1. Minimum Weight: 26 oz./sq. yd.
   2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.

2.6 FLEXIBLE DUCTS

A. General: Comply with UL 181, Class 1.

B. Flexible Ducts - Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch-thick, glass fiber insulation around a continuous inner liner.
   1. Reinforcement: Steel-wire helix encapsulated in the inner liner.
   2. Outer Jacket: Glass-reinforced, silver mylar.
   3. Inner Liner: Polyethylene film.
   4. Pressure Rating: 10-inches wg, positive.
   5. R value = 6.0

C. Woven Polypropylene Hanging Strap:
1. Hanging straps shall be manufactured of woven polypropylene 1¾" wide and having a minimum 400-pound tensile strength.
2. Strap material shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50.
3. Strap material shall be manufactured for flexible HVAC duct support and shall be installed in accordance with the manufacturer's instructions and SMACNA standards.
4. Straps shall be used on flexible ducts only, and not on rigid ductwork.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of duct accessories. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install duct accessories according to manufacturer's installation instructions and applicable portions of details of construction as shown in SMACNA standards.

B. Install volume control dampers in lined duct with methods to avoid damage to liner and to avoid erosion of duct liner.

C. Install fire and smoke dampers according to the manufacturer's UL-approved printed instructions.

D. Install fusible links in fire dampers.

E. Label access doors according to Division 23 Section "Mechanical Identification."

3.3 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire and smoke dampers for proper action.

C. Final positioning of manual dampers is specified in Division 23 Section "Testing, Adjusting, and Balancing."

END OF SECTION 23 33 00

DIVISION 23 - HVAC
SECTION 23 34 23 - POWER AND GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Ceiling-mounted ventilators.
   2. Propeller fans.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base air ratings on actual site elevations.

B. Operating Limits: Classify according to AMCA 99.

C. Fan Unit Schedule: The following information is described in an equipment schedule on the Drawings.
   1. Fan performance data including capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
   2. Fan arrangement including wheel configuration, inlet and discharge configurations, and required accessories.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data including rated capacities of each unit, weights (shipping, installed, and operating), furnished specialties, accessories, and the following:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound power ratings.
   3. Motor ratings and electrical characteristics plus motor and electrical accessories.
   4. Material gages and finishes, including color charts.
   5. Dampers, including housings, linkages, and operators.

C. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

D. Wiring diagrams detailing wiring for power and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.

E. Maintenance data for power ventilators to include in the operation and maintenance manual.

1.5 QUALITY ASSURANCE

A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.

B. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

C. AMCA Compliance: Provide products that meet performance requirements and are licensed to use the AMCA Seal.

D. NEMA Compliance: Provide components required as part of fans that comply with applicable NEMA standards.

E. UL Standard: Provide power ventilators that comply with UL 705.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements. Verify clearances.

B. Do not operate fans until ductwork is clean, filters are in place, bearings are lubricated, and fans have been commissioned.

1.7 COORDINATION AND SCHEDULING

A. Coordinate the size and location of support members.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTED VENTILATORS

A. Description: Centrifugal fans designed for installing in ceiling or wall, or for concealed in-line applications.

B. Housing: Galvanized steel.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille (Ceiling Mounted): Aluminum grille with baked enamel finish. Furnish in-line configuration where indicated.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in. (Integral disconnect device.)

F. Variable-Speed Controller: Solid-state control to reduce speed from 100 percent to less than 50 percent.

G. Accessories: Manufacturer's standard roof jack or wall cap, and transition fittings where indicated on the drawings.

2.2 PROPELLER FANS

A. Description: Belt-driven or direct-drive propeller fans, as indicated, consisting of fan blades, hub, housing, orifice ring, motor, drive, and accessories.

B. Housings: Galvanized steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat after assembly.

C. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.

D. Belt-Driven Drive Assembly: Resiliently mounted to the housing, statically and dynamically balanced and selected for continuous operation at the maximum rated fan speed and motor horsepower (HP), with final alignment and belt adjustment made after installation.
   1. Service Factor Based on Fan Motor: 1.4.
   2. Fan Shaft: Turned, ground, and polished steel keyed to wheel hub.

3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
   a. Ball-Bearing Rated Life: AFBMA 9, L-10 of 100,000 hours.
4. Pulleys: Cast iron with split, tapered bushing, dynamically balanced at factory.
5. Motor Pulleys: Adjustable pitch for use with motors through 5 HP; fixed pitch for use with motors larger than 5 HP. Select pulley so pitch adjustment is at the middle of the adjustment range at fan design conditions.
6. Belts: Oil resistant, non-sparking, and non-static; matched sets for multiple belt drives.
7. Belt Guards: Fabricate of steel for motors mounted on the outside of the fan cabinet.

E. Accessories: The following accessories are required as indicated:
1. Gravity Shutters: Aluminum blades in aluminum frame, interlocked blades with nylon bearings.
2. Motor-Side Back Guard: Galvanized steel, conforming to OSHA specifications, removable for maintenance.
3. Wall Sleeve: Galvanized steel to match fan and accessory size.
4. Variable-Speed Controller: Solid-state control to reduce speed from 100 percent to less than 50 percent.
5. Disconnect Switch: Non-fusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

2.3 MOTORS

A. Motor Construction: NEMA MG 1, general purpose, continuous duty, Design B. Furnish premium efficiency motors for all above 1 horsepower.

B. Enclosure Type: The following features are required as indicated:
1. Open drip-proof motors where satisfactorily housed or remotely located during operation.
2. Guarded drip-proof motors where exposed to contact by employees or building occupants.

2.4 FACTORY FINISHES

A. Sheet Metal Parts: Prime coat before final assembly.

B. Exterior Surfaces: Baked-enamel finish coat after assembly.

C. Aluminum Parts: No finish required.

2.5 SOURCE QUALITY CONTROL

A. Testing Requirements: The following factory tests are required as indicated:
1. Sound Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings From Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA Seal.
2. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements of installation tolerances and other conditions affecting performance of the power ventilators. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install power ventilators according to manufacturer's written instructions.

B. Support units using the vibration-control devices indicated. Vibration-control devices are specified in Division 23 Sections.
   1. Ceiling Units: Suspend units from structure using steel wire or metal straps.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Division 23.

3.3 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.

B. Electrical: Conform to applicable requirements in Division 26 Sections.

C. Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly of components and installation of fans, including duct and electrical connections, and to report results in writing.

3.5 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

3.6 CLEANING

A. After completing installation, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes including chips, scratches, and abrasions.

B. Clean fan interiors to remove foreign material and construction debris. Vacuum clean fan wheel and cabinet.

3.7 COMMISSIONING

A. Final Checks before Startup: Perform the following operations and checks before startup:
   1. Verify that shipping, blocking, and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that connections for piping, ducts, and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnects.
   3. Perform cleaning and adjusting specified in this Section.
   4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
   5. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
   6. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in the fully open position.
   7. Disable automatic temperature-control operators.

B. Starting procedures for fans are as follows:
   1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM.
   2. Measure and record motor voltage and amperage.

C. Shut unit down and reconnect automatic temperature-control operators.

D. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for procedures for air-handling-system testing, adjusting, and balancing.

E. Replace fan and motor pulleys as required to achieve design conditions.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

B. Review data in the operation and maintenance manuals.

C. Schedule training with Owner, through the Design Professional, with at least 7 days' advance notice.

D. Demonstrate operation of power ventilators.

END OF SECTION 23 34 23

DIVISION 23 - HVAC
SECTION 23 37 13 - DIFFUSERS, REGISTERS, GRILLES AND LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, grilles and louvers.

1.3 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

C. Register: A combination grille and damper assembly over an air opening.

D. Louver: Exterior wall air device which resists the penetration of rain.

1.4 SUBMITTALS

A. Product Data: For each model indicated, include the following:
   1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
   2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
   3. Schedule of diffusers, registers, grilles and louvers indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
   4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings and schedules indicate specific requirements of diffusers, registers, grilles and louvers and are based on the specific requirements of the systems indicated. Other manufacturers' products with equal performance characteristics may be considered.

B. NFPA Compliance: Install diffusers, registers, grilles and louvers according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. All louver face ceiling diffusers shall have four cones and removable cores.

B. All exterior louvers shall be 6-inches deep.

2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, grilles and louvers are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, grilles and louvers level and plumb according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where Design Professional features or other items conflict with installation, notify Design Professional for a determination of final location.

C. Install diffusers, registers, grilles and louvers with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, grilles and louvers to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers, registers, grilles and louvers, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION 23 37 13

DIVISION 23 - HVAC
SECTION 23 81 26 - SPLIT SYSTEM HEAT PUMPS AND AIR CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes split system heat pump units, air conditioners, and related components.

1.3 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities of selected model clearly indicated; dimensions; required clearances; shipping, installed, and operating weights; furnished specialties; accessories; and installation and startup instructions.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.
   2. Refrigerant piping schematics showing sizes and accessories. Confirmation of refrigerant pipe size and specifications required by the manufacturer.

C. Commissioning Reports: Indicate results of startup and testing commissioning requirements. Submit dated and signed copies of checklists.

D. Maintenance Data: For equipment to include in the maintenance manuals.

E. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

B. Energy Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

C. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Listing and Labeling: Provide electrically operated components specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

E. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver indoor and outdoor units as factory-assembled units with protective crating and covering. Store equipment protected from weather.

B. Coordinate delivery of units in sufficient time to allow movement into building.

C. Handle units to comply with manufacturer's written rigging and installation instructions for unloading and moving to final location.

1.6 COORDINATION

A. Coordinate installation of concrete pads and equipment supports.

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article 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.

B. Special Warranty: A written warranty, executed by the manufacturer and signed by the Contractor, agreeing to replace components that fail in materials or workmanship, within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.
   1. Warranty Period, Compressors: Manufacturers standard, but not less than 5 years after date of Material Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Filters: Three sets of filters for each unit having disposable filters.

PART 2 - PRODUCTS

2.1 DUCTED SPLIT SYSTEM HEAT PUMPS AND AIR CONDITIONERS

A. Unit shall be of size, type and capacity as indicated on the Drawings.

B. Outdoor units shall be constructed of heavy gauge galvanized steel cabinet with weather resistant baked enamel finish. The unit shall contain hermetic compressor with high-and-low pressure protection, crankcase heater, compressor overload protection, and phase-loss protection (where applicable). Refrigerant circuit shall include vapor and liquid line back-seating type service valves with gauge ports, filter and factory furnished holding charge of refrigerant. Compressors shall have a 5-year warranty. The outdoor coils shall be all-aluminum, fully brazed with flat micro-channel tubes. The outdoor coil shall have expansion valve refrigerant control during heating operation, and automatic temperature/pressure actuated defrost control system. Condenser fans shall be direct drive, vertical discharge type. Controls shall be factory-wired and readily accessible. Compressors shall have 24-volt control transformer and magnetic contactor.
   1. When the unit listed in the Equipment Schedule or the unit that is the "Basis of Design" has multiple compressors, "equal" equipment with a single unloading compressor will not be acceptable. Furnish multiple condensing outdoor units.
   2. Provide manufacturer’s standard condenser coil guards.
   3. Provide the following accessories:
      a. 5-Minute Anti-Recycle Timer
      b. Hard Start Kit for Single Phase Units
      c. Crankcase Heater (Where recommended by equipment manufacturer.)
      d. Defrost Thermostat for Indoor Coil
      e. Room Thermostat (see Control System specifications)
      f. Condenser Coil Guard
      g. Where filter frame is not integral to indoor unit, provide accessory frame meeting specification below.
      h. Low Ambient Controls (down to 0°F).
      i. Outdoor air thermostat to prevent resistance heat from energizing above 45ºF (adj.)
      j. Where indicated on the drawings, provide hot gas reheat coil and controls within the standard indoor unit cabinet.

C. Indoor units shall be constructed of heavy gauge steel with baked enamel finish and shall be internally lined with foil-faced R-4.2, minimum insulation. Air-handler shall be provided with a low voltage terminal board and fan motor relay. Blower shall be belt or direct driven. Belt driven fan shall have a variable pitch drive pulley. Direct drive motors shall have a minimum of three speeds. Evaporator coil shall have expansion device, check valve and defrost thermostat accessory. Indoor unit shall be complete with filter rack and 1-inch thick (min.) disposable filter(s). Filter(s) shall be furnished with frames. Unframed hogs-hair filter(s) and washable filters are not acceptable.

D. Provide hot gas or hot liquid reheat coil and associated piping, and controls where indicated.

E. Auxiliary electric heaters shall be of size and capacity and furnished with stages indicated on the drawings. Heater shall be designed specifically for the indoor unit and shall meet all requirements of the National Electric Code and Underwriters Laboratories and shall be so stamped.

2.2 REFRIGERANT PIPE SIZE

A. Pipe sizes shown on the drawings are for estimating purposes only. Final pipe sizes shall be selected by the manufacturer and shall be included in the submittal data. Accessories (larger crankcase heaters, liquid line solenoid valve, oversize suction accumulators, wind baffles, etc.) required or recommended by the equipment manufacturer shall be provided at no additional cost.

2.3 EMERGENCY DRAIN PAN

A. Provide 22-gauge galvanized emergency drain pan under all air handling units having water or drain connections. Drain pan shall extend 6" beyond unit on all sides, shall have 2" high hemmed sides. All seams and joints shall be soldered liquid tight. Exception: Emergency drain pans are not required for slab-on-grade equipment.

B. Furnish water-sensing cutoff switch in the emergency drain pan which de-energizes the associated HVAC system when moisture is present in the pan.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine installation locations for compliance with requirements for conditions affecting installation and performance of units. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units according to manufacturer's written instructions.

B. Furnish float switch for unit shutdown interlock. Install in a vertical tee off the main condensate line, or if installed in the overflow drain connection, provide a means of draining the overflow line (threaded cap, etc.).

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
1. Install piping to allow service and maintenance.

B. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. Furnish flexible connections at all unit connections.

C. Electrical: Conform to applicable requirements in Division 26 Sections.

D. Ground equipment.
   1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 COMMISSIONING

A. Verify that installation is as indicated and specified.

B. Complete manufacturer's installation and startup checks and perform the following:
   1. Level unit on support structure.
   2. Inspect for visible damage to unit casing.
   3. Inspect for visible damage to compressor, air-cooled condenser coil, and fans.
   4. Verify that clearances have been provided for servicing.
   5. Check that labels are clearly visible.
   6. Verify that controls are connected and operable.
   7. Remove shipping bolts, blocks, and tie-down straps.
   8. Verify that filters are installed.
   9. Adjust vibration isolators.
   10. Check acoustic insulation.
   11. Verify refrigerant piping and specialties have been installed in accordance with manufacturer’s requirements (where applicable).

C. Lubricate bearings on fan.

D. Check fan-wheel rotation for correct direction without vibration and binding.

E. Adjust fan belts to proper alignment and tension.

F. Start unit according to manufacturer's written instructions. Complete startup sheets and attach copy with Contractor's startup report.

G. Check and record performance of interlocks and protection devices; verify sequences.

H. Operate unit for an initial period as recommended or required by manufacturer.

I. Calibrate thermostats and adjust all control settings.

J. Check internal isolators.

K. Check controls for correct sequencing of heating, refrigeration, and normal and emergency shutdown.

L. Simulate maximum cooling demand and check the following:
   1. Compressor refrigerant suction and hot-gas pressures.
   2. Short circuiting air through condenser or from condenser to outside-air intake.

M. After starting and performing testing, change filters, vacuum heat exchanger and cooling and condenser coils, lubricate bearings and adjust belt tension.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
   1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
   2. Review data in the maintenance manuals.

3. Schedule training with Owner, through the Design Professional, with at least 7 days' advance notice.
4. Provide letter from factory service representative stating that equipment is installed and operating as per manufacturer’s recommendations.

END OF SECTION 23 81 26

DIVISION 23 - HVAC
SECTION 23 82 39 - UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. This Section includes unit heaters.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product data for each type of product specified.

C. Wiring diagrams detailing power and control wiring and differentiating clearly between manufacturer-installed wiring and field-installed wiring.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in manufacturing unit heaters similar to those indicated for this Project and that have a record of successful in-service performance.

B. Comply with NFPA 70 for components and installation.

C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

PART 2 - PRODUCTS

2.1 ELECTRICAL UNIT HEATERS

A. Heating Elements: Nickel-chromium heating wire element; free from expansion noise and 60-Hz hum; embedded in magnesium oxide, insulating refractory; and sealed in high-mass steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends are enclosed in terminal box. Fin surface temperature does not exceed 550 deg F at any point during normal operation.

B. Heater Circuit Protection: One-time fuses in terminal box for overcurrent protection and limit controls for overtemperature protection of heaters.

C. Fan and Motor: Direct-drive propeller fan and manufacturer's standard motor. Motors sized 1 hp and less include motor overload protection.

D. Wiring Terminations: Match conductor materials and sizes indicated.

E. Discharge Configuration: Horizontal discharge with horizontal, adjustable louvers.

F. Optional Accessories: Include the following:
1. Integral thermostat.
2. Safety-switch disconnect on cover of terminal box.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and supports to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of units. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install unit heaters as indicated, according to manufacturer's written instructions and NFPA 90A.

B. Connect unit heaters and components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

3.3 FIELD QUALITY CONTROL

A. Testing: After installing unit heaters and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

B. Remove and replace malfunctioning units with new units and retest.

END OF SECTION 23 82 39

DIVISION 26 - ELECTRICAL
SECTION 26 00 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Division of the specifications (260000) covers the complete interior and exterior electrical system for all work shown on the drawings as specified herein providing all material, labor and equipment required for the installation of the electrical systems complete and in operating condition.

B. Include in the electrical work all the necessary supervision and the issuing of all coordinating information to any other trades who are supplying work to accommodate the electrical installations.

C. Submittal, Record Drawing and Operation and Maintenance Manual Procedures.

1.2 SUBMITTALS

A. HVAC/Plumbing/Electrical Equipment connection coordination letter as noted below:

B. Before submitting shop drawings, Electrical Sub-Contractor shall along with the Mechanical and Plumbing Sub-Contractor review unit locations, unit quantities, unit voltage, phase, MCA and MOCP requirements for mechanical and plumbing equipment to determine the compatibility between what the Mechanical and Plumbing Sub-Contractor is providing and installing versus what is shown in the contract drawings. The Electrical Sub-Contractor shall along with his gear submittals submit a statement that he has reviewed all equipment shop drawings with the Mechanical and Plumbing Sub-Contractors. Any discrepancy between such shall be listed for Engineer review and corrective action. Do not submit the electrical gear without this coordination letter. Contractor is to note that electrical gear submitted without this coordination letter shall not be reviewed, nor returned until Engineer receives such coordination letter.

C. Utility Provider(s) coordination letters.

1.3 COORDINATION

A. This Contractor shall schedule his work and in every way possible cooperate with all other Contractors on the job to avoid delays, interferences, and unnecessary work. He shall notify them of all openings, hangers, excavations, etc., so that proper provisions shall be made for his work. This shall not relieve him of the cost of cutting, when such is required.

B. This Contractor shall do all cutting and excavating necessary for the complete installation of his work, but he shall not cut the work of any other Contractor without first consulting the Architect. He shall repair any work damaged by him or his workmen, employing the services of the Contractor whose work is damaged. Saw cut existing slab as required for routing conduits and floor boxes noted to be installed in existing floors. Restore to original finish.

C. This Contractor shall by all means coordinate the location of ceiling lighting fixtures, both recessed and surface mounted, with the Ceiling Contractor so that proper hangers and supports shall be provided.

D. Any conflict between electrical and other trades shall be reported before construction starts. No extra charges will be approved for work resulting from failure to coordinate with other trades.

E. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

2. To provide for ease of disconnecting the equipment with minimum interference to other installations.

3. To allow right of way for piping and conduit installed at required slope.

4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

F. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

G. Coordinate sleeve selection and application with selection and application of fire stopping.

1.4 DRAWINGS

A. The drawings for electrical work utilize symbols and schematic diagrams which have no dimensional significance. The work shall therefore, be installed to fulfill the diagrammatic intent expressed on the electrical drawings.

B. Review architectural drawings for door swings, cabinets, counters, moldings and built-in equipment, conditions indicated on architectural drawings shall govern. Prior to rough-in of receptacles and systems outlets refer to architectural casework drawings for rough-in coordination.

C. Coordinate electrical work with the architectural details, floor plans, elevations, structural and mechanical drawings. Provide fittings, junction boxes and accessories to meet conditions.

D. Do not scale drawings. Dimensions for layout of equipment, or spaces shall be obtained from architectural, structural or mechanical drawings unless specifically indicated on the electrical drawings.

E. Discrepancies shown on different drawings, between drawings and specifications or between drawings and field conditions shall be promptly brought to the attention of the Architect.

F. Provide as used on the drawings and in the specifications shall mean furnish, install, connect, adjust and test.

G. The drawings and specifications are complimentary and any work or material shown in one and omitted in the other, or described in the one and not shown in the other, or which may be implied by both or either, shall be furnished as though shown on both, in order to give a complete and first class installation.

1.5 CODES AND PERMITS

A. All electrical work shall meet or exceed the latest requirements of the following codes and/or other authorities exercising jurisdiction over the electrical construction work and the project.

1. The National Electrical Code (NFPA 70) - 2020 Edition

2. The National Electrical Safety Code (ANSI C-2)

3. The Life Safety Code (NFPA 101) - 2018 Edition

4. The International Building Code - 2018 Edition

5. Regulations of the local utility company with respect to metering and service entrance.

6. Municipal and State ordinances governing electrical work.

B. All required permits and inspection certificates shall be obtained, and made available at the completion of the work. Permits, inspections, and certification fees shall be paid for as a part of the electrical work.

1.6 EQUIPMENT CONNECTIONS

A. All equipment requiring electrical power connections shall be connected under this Division of these specifications.

B. Where electrical connections to equipment require specific locations, such locations shall be obtained from shop drawings.

C. Drawings for location of conduit stub-up boxes mounted in wall or floor to serve specific equipment shall not be scaled.

D. Electrical circuits to equipment furnished under other sections of these specifications are based on design loads. If actual equipment furnished has loads other than design loads, the electrical circuits and protective devices shall be revised to be compatible with equipment furnished at no additional cost to the Owner. Any revisions must have prior approval by the Architect.

E. Before submitting shop drawings, Electrical Sub-Contractor shall along with the Mechanical and Plumbing Sub-Contractor review unit locations, unit quantities, unit voltage, phase, MCA and MOCP requirements for mechanical and plumbing equipment to determine the compatibility between what the Mechanical and Plumbing Sub-Contractor is providing and installing versus what is shown in the contract drawings. The Electrical Sub-Contractor shall along with his gear submittals submit a statement that he has reviewed all equipment shop drawings with the Mechanical and Plumbing Sub-Contractors. Any discrepancy between such shall be listed for Engineer review and corrective action. Do not submit the electrical gear without this coordination letter. Contractor is to note that electrical gear submitted without this coordination letter shall not be reviewed, nor returned until Engineer receives such coordination letter.

F. Where equipment is indicated to be served thru conduit stub-up, conduit shall be stubbed up not less than four inches above floor where transition shall be made to sealtite flexible conduit for connection to equipment.

G. The Contractor's attention is invited to other Divisions of these specifications, where equipment requiring electrical service or electrically related work is specified to become fully aware of the scope of work required for electrical service or related work.

H. Where electricity utilizing equipment is supplied separate from the electrical work, and is energized, controlled or otherwise made operative by electrical work, the testing to provide the proper functional performance of such wiring systems shall be conducted by the trade responsible for the equipment. The electrical work shall, however, include cooperation in such testing and the making available of any necessary testing or adjustments to the electrical equipment.

I. Heating, air conditioning, and ventilating equipment is specified to be furnished and installed under other sections of these specifications. The controls likewise are specified to be furnished there under. All necessary wiring, wiring troughs and circuit breakers for power for this equipment shall be furnished and installed under this section of the specifications, in accordance with the plans and/or diagrams furnished with the equipment, or shown on these plans. Starters furnished by the Mechanical Contractor shall be installed under this Division of the specifications. Power wiring to auxiliary equipment on a piece of equipment remote from its main terminal box and interlocking of apparatus shall be accomplished under Heating Ventilating Equipment section of the specifications. Conduit and outlets for control wiring shall be furnished and installed under Division 15 of these specifications. Control conductors for mechanical equipment shall not be installed in same conduit with power conductors.

J. Contractor is to note that location of disconnect switches shown are schematic in nature. Exact location of disconnect switch and mounting height shall be coordinated with field conditions and equipment shop drawings. Locate disconnect as required to maintain clearances required by National Electrical Code.

K. Contractor shall provide a rooftop mounted, GFCI receptacle with weatherproof cover within 20' of a rooftop mounted HVAC unit. Serve from closest receptacle circuit with ½"C., 3#12's. See mechanical plan for unit locations.

L. All conduit routed from disconnect to exterior HVAC units shall be routed underground. Turn up adjacent to unit and make transition to sealtite to serve unit. Conduit shall be routed to nearest wall and be concealed in wall. Conduit not shall be installed on grade and sealtite whips from wall to units is not acceptable.

M. All conduit serving rooftop HVAC equipment (rooftop air handler, fans, etc.) shall be concealed in HVAC roof curb. Utilize flexible conduit to routed feeder to service point. Conduits shall not be turned up in individual roof penetrations.

1.7 GUARANTEE

A. Defective lamps shall be replaced up-to-date of acceptance and shall be guaranteed for entire length of warranty as specified by the Architect.

B. All systems and component parts shall be guaranteed entire length of warranty as specified by the Architect from the date of final acceptance of the complete project. Defects found during this guaranteed period shall be promptly corrected at no additional cost to the Owner.

1.8 PRODUCT DATA, SAMPLES AND SHOP DRAWINGS SUBMITTAL PROCEDURE

A. Submit for approval by the Architect all materials and equipment to be incorporated in the electrical work.

B. Submit only shop drawings which comply with the contract documents. Shop drawings shall be checked and corrected by the Contractor before they are submitted to the Architect. Shop drawings that are not corrected by the Contractor shall be returned for correction without detailed notations by the Architect as to the necessary corrections.

C. Mark each individual submittal item to show specification section which pertains to the item.

D. Submit information as required under SUBMITTALS, for each of the individual electrical sections of the specifications.

E. Data submitted shall contain all information required to indicate compliance with equipment specified.

F. Submit field information drawings to explain fully all procedures involved in erecting, mounting and connecting all items of equipment which differ from that specified.

G. When Shop Drawings are reviewed, some errors may be detected but others may be overlooked. This does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings, the requirements of the Drawings and Specifications shall be followed and are not waived or superseded in any way by the Shop Drawing review.

1.9 RECORD DRAWINGS

A. One complete set of electrical drawings shall be reserved for as-built drawings. Any approved deviation from the contract drawings shall be recorded on these drawings. Drawings shall be checked monthly for completeness.

B. Completed as-built drawings shall be presented to the Architect prior to final inspection.

1.10 MAINTENANCE AND OPERATING INSTRUCTIONS

A. Provide at the time of final inspection three sets of maintenance and operating instruction for:

1. Lighting and Power Panelboards
2. Fuses
3. Wiring Devices
4. Lighting Fixtures and Lamps
5. Lighting Control Panels and Sensors
6. Disconnect Switches
7. Fire Alarm System
8. Surge Protection System

B. Furnish a qualified and accredited factory trained technician to train personnel designated by the Owner in the proper operation and maintenance of specialized equipment.

C. The issuing of operating instructions shall include the submission of the name, address, and telephone number of the manufacturer's representative and service company for each item of equipment so that service and spare parts can be readily obtained.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials specified by manufacturer's name shall be used unless approval of other manufacturers is listed in addenda to these specifications.

B. Drawings indicating proposed layout of space, all equipment to be installed therein and clearance between equipment shall be submitted, where substitution of materials alter space requirements on the drawings.

C. Material Standards: All materials shall be new and shall conform to the standards where such have been established for the particular material in question. Publications and Standards of the organization listed below are applicable to materials specified herein.

1. American Society for Testing and Materials (ASTM)
2. Underwriter's Laboratories, Inc. (UL)
3. National Electrical Manufacturer Association (NEMA)
4. Insulated Cable Engineers Association (ICEA)
5. Institute of Electrical and Electronic Engineers (IEEE)
6. National Fire Protection Association (NFPA)

7. American National Standards Institute (ANSI)

D. Material of the same type shall be the product of one manufacturer.

E. Materials not readily available from local sources shall be ordered immediately upon approval.

F. The Architect shall have authority to reject any materials, or equipment, not complying with these specifications and have the Contractor replace materials so rejected immediately upon notification of rejection.

G. Any material or equipment so rejected shall be removed from the job within 24 hours of such rejection; otherwise the Architect may have same removed at the Contractor's expense.

2.2 PRODUCT DELIVERY, STORAGE, HANDLING, & PROTECTION

A. Inspect materials upon arrival at Project and verify conformance to Contract Documents. Prevent unloading of unsatisfactory material. Handle materials in accordance with manufacturer's applicable standards and suppliers recommendations, and in a manner to prevent damage to materials. Store packaged materials in original undamaged condition with manufacturer's labels and seals intact. Containers which are broken, opened, damaged, or watermarked are unacceptable and shall be removed from the premises.

B. All material, except items specifically designed to be installed outdoors such as pad mounted transformers or stand-by generators, shall be stored in an enclosed, dry building or trailer. Areas for general storage shall be provided by the Contractor. Provide temperature and/or humidity control where applicable. No material for interior installation, including conductors, shall be stored other than in an enclosed weather tight structure. Equipment stored other than as specified above shall be removed from the premises.

C. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Conditions shall be those for which the equipment or materials are designed to be installed. Equipment and materials shall be protected from water, direct sunlight, cold or heat. Equipment or materials damaged or which are subjected to these elements are unacceptable and shall be removed from the premises and replaced.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

F. Raceways, fixtures, devices, and other electrical equipment shall be installed in a neat and workmanlike manner.

G. The Architect or his representative shall have the authority to reject any workmanship not complying with the contract documents.

H. The Electrical Contractor shall personally or through an authorized licensed and competent electrician, constantly supervise the work from beginning to complete and final inspection.

I. Electrical equipment shall be installed in accordance with manufacturer's recommendations.

J. Locations of proposed raceway, riser, location of structural elements, location and size of chases method and type of construction of floors, walls, partitions, etc., shall be verified before construction starts.

K. Consult owner and utility companies for underground lines before any underground work is started. Contractors shall be responsible for any damage.

L. All empty conduits shall have a pull string installed. All flush recessed boxes shall have blank plates installed.

3.2 CLEANING AND PAINTING

A. Remove oil, dirt, grease and foreign materials from all raceways, fittings, boxes, panelboard trims and cabinets to provide a clean surface for painting. Touch-up scratched or marred surfaces of lighting fixtures, panelboard and cabinet trims, motor control center, switchboard or equipment enclosures with paint furnished by the equipment manufacturers specifically for that purpose.

B. Do not paint trim covers for flush mounted panelboards, telephone cabinets, pull boxes, junction boxes and control cabinet unless required by the Architect. Remove trim covers before painting. Under no conditions shall locks, latches or exposed trim clamps be painted.

C. Unless indicated on the drawings or specified herein to the contrary, all painting shall be done under the PAINTING Section of these Specifications.

D. Where plywood backboards are used to mount equipment provided under Division 26, paint backboards with two coats of light grey semi-gloss paint. Plywood shall be 3/4" fire rated plywood. Paint shall be fire retardant paint.

3.3 DEVIATIONS

A. No deviations from the plans and specifications shall be made without the full knowledge and consent of the Architect or his authorized representative.

B. Should the Contractor find at any time during progress of the work that, in his judgment, existing conditions make desirable a modification in requirements covering any particular item or items, he shall report such items promptly to the Architect for his decision and instruction.

3.4 EXCAVATION, TRENCHING AND BACKFILLING

A. General. The Contractor shall perform all excavation to install conduit structures and equipment specified in this Division of the Specifications. During excavation, materials for backfilling shall be piled back from the banks of the trench to avoid over-loading and to prevent slides and cave-ins. All excavated materials not to be used for backfill shall be removed and disposed of by the Contractor. Grading shall be done to prevent surface water from flowing into trenches and other excavations and water accumulating therein shall be removed by pumping. All excavations shall be made by open cut. No tunneling shall be done. All requirements of OSHA shall be complied with.

B. Trench Excavation. The bottom of the trenches shall be graded to provide uniform bearing and support for each section of the conduit on undisturbed soil at every point along its entire length. Over

depths shall be backfilled with loose, granular, moist earth, tamped. Removed unstable soil that is not capable of supporting the conduit and replace with specified material.

C. Backfilling. The trenches shall not be backfilled until it is reviewed by the Architect or his representative. The trenches shall be backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, and gravel or soft shale, free from large clods of earth or stones, deposited in 6" layers and tamped until the conduit has a cover of not less than the adjacent existing ground but not greater than 2" above existing ground. The backfilling shall be carried on simultaneously on both sides of the trench so that conduit is not displaced. The compaction of the filled trench shall be at least equal to that of the surrounding undisturbed material, except that trenches occurring under paved areas or in areas to be filled shall be backfilled in 6" maximum layers and each layer compacted to 95% maximum density. Settling the backfill with water will not be permitted. Any trenches not meeting compaction requirements or where settlement occurs shall have backfill removed down to the top of the conduit then backfill with approved materials as specified hereinbefore.

D. Positively no tree roots are to be damaged, hand dig where required. Damaged trees or shrubbery shall be replaced in kind and must be approved by Engineer.

3.5 FIRESTOPPING

A. Apply fire stopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly.

3.6 SCHEDULING OF OUTAGES

A. Electrical work requiring interruption of electrical power which would adversely affect the normal operation of the other portions of the Owner's property shall be done at time other than normal working hours. Normal working hours shall be considered eight A.M. to five P.M. Monday through Friday.

B. Schedule all work requiring interruption of electrical power two weeks prior to actual shutdown. Submit schedule in writing to Architect indicating extent of system to be de-energized, date and time when power is intended to be interrupted, and date and time power will be restored. Schedule shall be subject to the review of the Architect and the Representative of the Owner.

3.7 CONSTRUCTION REVIEWS

A. The Architect or his representative shall observe and review the installation of all electrical systems shown on the drawings and as specified herein.

B. Before covering or concealing any conduit below grade or slab, in wall or above ceiling, the contractor shall notify the Architect so that he can review the installation.

3.8 CONTRACTOR'S FINAL INSPECTION

A. Contractor shall refer to individual electrical specification sections for all testing, commissioning and training requirements specific to each section.

B. At the time of the Contractor's final inspection, all systems shall be checked and tested for proper installation and operation by the Contractor in the presence of the Architect or his representative.

C. The Contractor shall furnish the personnel, tools and equipment required to inspect and test all systems.

D. Following is a list of items that the contractor must demonstrate to the Architect or his representative as complying with the plans and specifications. Please note that this list does not necessarily represent all items to be covered in the final inspection, but should give the Contractor an idea of what is to be reviewed.

1. Demonstrate that all panels have breakers as specified, ground bar, copper bus, typed directory for circuit identification and that they are free of trash.

2. Demonstrate that all conduits are supported as required by the National Electrical Code.

3. Demonstrate that all conductors are providing with correct color coding. This should include all branch circuit neutral conductor striping.

4. Demonstrate that all outlet boxes above or on the ceiling are supported as required by the National Electrical Code.

5. Demonstrate that outlet boxes in wall or ceilings of combustible materials are flush with surface of wall or ceiling, and that outlet boxes in walls or ceilings of non-combustible materials are so installed that the front edge of the box or plaster ring is not set back more than 1/4".

6. Demonstrate that outlet boxes in wall are secure.

7. Demonstrate that all devices are properly secured to boxes, that device plates are properly aligned and are not being used to secure device.

8. Utilizing a Woodhead No. 1750 testing device, demonstrate that all 125 volt receptacles are properly connected.

9. Demonstrate that all fixtures have specified lamps, drivers and lens, and that they are supported as required by the National Electrical Code or as called for on the drawings or in the specifications.

10. Demonstrate that all disconnects requiring fuses are fused with the proper size and type, and that all disconnects are properly identified.

11. Demonstrate that Fire Alarm System is in proper working order, initiating an alarm signal from each manual and automatic device (including smoke detectors).

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Metal-clad cable, Type MC, rated 600 V or less.
3. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. **Alpha Wire Company.**
2. **Cerro Wire LLC.**
3. **Encore Wire Corporation.**
4. **General Cable; General Cable Corporation.**
5. **Senator Wire & Cable Company.**
6. **Southwire Company.**

2.2 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

D. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.
2. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
3. Type XHHW-2: Comply with UL 44.

2.3 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. RoHS compliant.
4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Circuits:

1. Single circuit and multicircuit with color-coded conductors.

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Ground Conductor: Insulated.

F. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

G. Armor: Steel, interlocked.

H. Jacket: PVC applied over armor.

2.4 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Aluminum.
2. Type: One hole with long barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.

B. Feeders: Type THHN/THWN-2, single conductors in raceway.

C. Branch Circuits: Type THHN/THWN-2, single conductors in raceway.

D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Metal-clad cable, Type MC is allowed in the following applications only.

a. Maintain at least 6-inch clearance between metal clad cables and other piping systems. Maintain 12-inch clearance between metal clad cables and heat sources such as flues, steam pipes, and heating appliances.

b. No metal clad cable shall be fastened to other conduits or pipes or installed so as to prevent the ready removal of other pipes or ducts for repairs.

c. Where three (3) or more metal clad cables are suspended from the ceiling in parallel runs, use steel channels, Kindorf, Unistrut or equal, hung from 1/2-inch rods to support the conduits. The conduit on these channels shall be held in place with metal clad cable clamps designed for the particular channel that is used.

E. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.4 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 84 13 "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements.
2. Perform each of the following visual and electrical tests:

    a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    b. Test bolted connections for high resistance using one of the following:

        1) A low-resistance ohmmeter.
        2) Calibrated torque wrench.
        3) Thermographic survey.

    c. Inspect compression applied connectors for correct cable match and indentation.
    d. Inspect for correct identification.
    e. Inspect cable jacket and condition.
    f. Insulation-resistance test on each conductor with respect to ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
    g. Continuity test on each conductor and cable.
    h. Uniform resistance of parallel conductors.

B. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

DIVISION 26 – ELECTRICAL
SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding systems and equipment, plus the following special applications:
   1. Underground distribution grounding.
   2. Foundation steel electrodes

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

A. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
   1. Ground rods.
   2. Grounding arrangements and connections for separately derived systems.

B. Qualification Data: For qualified testing agency and testing agency's field supervisor.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in "Operation and Maintenance Data," include the following:

   1. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NFPA 70B.
      a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
      b. Include recommended testing intervals.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.

2.2 Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches by 12 inches (unless otherwise noted on drawings) in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
   1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
   1. Install bus on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
   2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.

3.2 Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.

C. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus unless otherwise noted.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 3/0 AWG.
1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.5 LABELING

A. Comply with requirements in Section 260553 "Electrical Identification" for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal , and at individual ground rods. Make tests at ground rods before any conductors are connected.
a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and

include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

DIVISION 26 – ELECTRICAL
SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.
   2. Construction requirements for concrete bases.

1.2 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Trapeze hangers. Include Product Data for components.
   2. Steel slotted support systems.
   3. Nonmetallic slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
   1. Trapeze hangers. Include Product Data for components.
   2. Steel slotted channel systems. Include Product Data for components.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Tyco International, Ltd.
      g. Wesanco, Inc.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-
   5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Cooper B-Line, Inc.; a division of Cooper Industries.
         2) Empire Tool and Manufacturing Co., Inc.
         3) Hilti Inc.
         4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
         5) MKT Fastening, LLC.
   2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
   3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slottedsupport system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 3 Section "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.
   1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor bolts to elevations required for proper attachment to supported equipment.
   3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

END OF SECTION

DIVISION 26 – ELECTRICAL
SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.2 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney; a brand of EGS Electrical Group.
6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company; a division of John Maneely Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. EMT: Comply with ANSI C80.3 and UL 797.

E. FMC: Comply with UL 1; aluminum.

F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.

2. Fittings for EMT:
   a. Material: Steel.
   b. Type: Provide compression type for two inches (2”) and smaller, steel set-screw type for conduits two and half inches (2 ½”) and larger.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

H. Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.
6. Condux International, Inc.
7. Electri-Flex Company.
8. Kraloy.
9. Lamson & Sessions; Carlon Electrical Products.
10. Niedax-Kleinhuis USA, Inc.
11. RACO; a Hubbell company.
12. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

E. Fittings for LFNC: Comply with UL 514B.

F. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Mono-Systems, Inc.

4. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 or Type 3R Type 4 as requied and unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Mono-Systems, Inc.
   b. Panduit Corp.
   c. Wiremold / Legrand.

2. Material: Galvanized steel with ivory baked-enamel finish.

3. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Adalet.

2. Cooper Technologies Company; Cooper Crouse-Hinds.

3. EGS/Appleton Electric.

4. Erickson Electrical Equipment Company.

5. FSR Inc.

6. Hoffman; a Pentair company.

7. Hubbell Incorporated; Killark Division.

8. Kraloy.

9. Milbank Manufacturing Co.

10. Mono-Systems, Inc.

11. O-Z/Gedney; a brand of EGS Electrical Group.

12. RACO; a Hubbell Company.

13. Robroy Industries.

14. Spring City Electrical Manufacturing Company.

15. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.

16. Thomas & Betts Corporation.

17. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

E. Metal Floor Boxes:

1. Office Floor Boxes shall be four gang. Wiremold RFB4The floor box shall be manufactured from stamped steel and be approved for use on above grade floors. The box shall be 12 3/4" L x 10" W x 3 7/16" H.There shall be four independent wiring compartments that allow capacity for up to four duplex receptacles and/or communication services. The RFB4 Series Box shall permit tunneling from end power compartment to end power compartment. The RFB4-4DB Series Box shall permit tunneling from adjacent or opposite compartments. Two of the four compartments shall have a minimum wiring capacity of 16.4 cu in. , one compartment shall have a minimum capacity of 32.3 cu in. , and one compartment shall have a minimum capacity of 50 cu in. . The box shall provide the following number of conduit knockouts: one 1/2" , three 1" , six 3/4" , and six 1 1/4" . The box shall be fully adjustable, providing a maximum of 1 7/8" pre-pour adjustment, and a maximum of 3/4" after-pour adjustment. The box shall provide a series of device mounting plates that will accept both duplex power devices, as well as plates that will accommodate Ortronics workstation connectivity outlets and modular inserts, the Pass & Seymour Network Wiring System, and other open system devices.

2. Conference Room floor boxes shall be Audio Visual type floor boxes. FSR FL-500P-6 Floor box shall be heavy gauge steel, 10" x 12" x 6" nominal dimensions, and shall be UL listed. Designed for installation in carpeted concrete floors. Floor box shall contain 3 separately partitioned cavities capable of accommodating 1 single-gang, 1 two-gang brackets, and one four-gang bracket. Floor boxes shall have 8 or more knockouts in trade sizes varying from 0.5" to 1.25" spaced uniformly on the sides and ends. Floor boxes shall have screw-attached, disposable, heavy gauge metal covers. Floor box shall have an 11 gauge finished cover. Location as shown on drawings, any significant variance (more than 9”) in location of any floor boxes Electrical Contractor is directed to notify Architect. Coordinate finish with Architect and/or Owner. (Provide one in each conference room)

3.

4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Nonmetallic Floor Boxes: Nonadjustable, round.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. qualified testing agency, and marked for intended location and application.

G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

J. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

K. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

L. Gangable boxes are not permitted unless indicated on drawings.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.

2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two..

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Armorcast Products Company.
   b. Carson Industries LLC.
   c. CDR Systems Corporation; Hubbell Power Systems.
   d. NewBasis.
   e. Oldcastle Precast, Inc.; Christy Concrete Products.
   f. Synertech Moulded Products; a division of Oldcastle Precast, Inc.

2. Standard: Comply with SCTE 77.

3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.

4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.

5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

6. Cover Legend: Molded lettering, "ELECTRIC" or “COMMUNICATION”.

7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.7 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.

2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.

3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: any conduit exposed to weather shall be GRC.

2. Concealed Conduit, Aboveground: EMT.

3. Underground Conduit: RNC, Type EPC-40-PVC.

4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.

2. Exposed, Not Subject to Severe Physical Damage: EMT.

3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT or RNC, Type EPC-40-PVC to 48”AFF.

5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.

6. Damp or Wet Locations: GRC.

7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.

2. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.

3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install surface raceways only where indicated on Drawings.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Raceways shall be embedded under Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.

2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

3. Arrange raceways to keep a minimum of 1 inch of concrete cover in all directions.

4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

5. Change from RNC, Type EPC-40-PVC to GRS ELBOW TO GRS TO ABOVE FLOOR THEN CHANGE TO EMT.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT for raceways.

2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Surface Raceways:

1. Install surface raceway with a minimum 2-inch radius control at bend points.

2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover

plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.

2. Where an underground service raceway enters a building or structure.

3. Where otherwise required by NFPA 70.

V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

W. Expansion-Joint Fittings:

1. Install in each run of above ground EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.

2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
   c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a rain tight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

EE. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit.

2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.

3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
   b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

4. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install hand holes with top of cover flush with top of finished grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION

DIVISION 26 – ELECTRICAL
SECTION 26 05 44 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
   2. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:
   1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
   1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
      a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
      b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
   2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

3. Size pipe sleeves to provide 1/4-inch annnular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.2 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.2 FLOOR MARKING TAPE

A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.

2. Printing on tape shall be permanent and shall not be damaged by burial operations.

3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.

2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.

3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2.5 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.

2. Punched or drilled for mechanical fasteners.

3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a black background. Minimum letter height shall be 3/8 inch.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 9 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

G. Painted Identification: Comply with requirements in Division 9 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.

2. Power.

3. Lighting

4. Fire Alarm System

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.

b. Colors for 208/120-V Circuits:

1) Phase A: Black.

2) Phase B: Red.

3) Phase C: Blue.

4) Neutral: White

5) Multi-wire branch circuit Dedicated Neutral: White with appropriate tracer (white with red tracer, white with blue tracer, white with black tracer).

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.

2) Phase B: Orange.

3) Phase C: Yellow.

4) Neutral: Gray

5) Multi-wire branch circuit Dedicated Neutral: White with appropriate tracer (gray with brown tracer, gray with orange tracer, gray with yellow tracer)

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.

2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

F. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.

2. Identify system voltage with black letters on an orange background.

3. Apply to exterior of door, cover, or other access.

4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.

b. Controls with external control power connections.

H. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

I. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch high letters for emergency instructions at equipment used for power transfer.

J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels

to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inchhigh letters on 1-1/2-inchhigh label; where two lines of text are required, use labels 2 inches high.

    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.

    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

    d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.

    b. Enclosures and electrical cabinets.

    c. Switchboards.

    d. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.

    e. Emergency system boxes and enclosures.

    f. Enclosed switches.

    g. Enclosed circuit breakers.

    h. Push-button stations.

    i. Power transfer equipment.

    j. Contactors.

    k. Remote-controlled switches, dimmer modules, and control devices.

    l. Power-generating units.

    m. Monitoring and control equipment.

    n. UPS equipment.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following lighting control devices:
   1. Indoor occupancy sensors.
   2. Switchbox-mounted occupancy sensors.
   3. Digital timer light switches.
   4. Emergency shunt relays.

1.2 SUBMITTALS

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

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

   1. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

E. Sample Warranty: For manufacturer's warranties.

1.3 QUALITY ASSURANCE

A. 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.

B. Products supplied shall be from a single manufacturer that has been continuously involved in manufacturing of occupancy sensors for a minimum of five years. Mixing of manufacturers shall not be allowed.

C. All components shall be U.L. listed, offer a five year warranty and meet all state and local applicable code requirements.

1.4 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.

   1. Failures include, but are not limited to, the following:

      a. Faulty operation of lighting control software.
      b. Faulty operation of lighting control devices.

2. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Lighting.
2. Leviton Mfg. Company Inc.
3. Greengate
4. Watt Stopper.

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc keep lighting off when selected lighting level is present.
8. All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems and rated motor loads.
9. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.
10. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. This control shall be recessed to prevent tampering.
11. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.
12. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.
13. All sensors shall have UL rated, 94V-0 plastic enclosures.

C. PIR Type: Wall/Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or a comparable product from the listed manufactures:

a. Watt Stopper: CX-100

2. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
3. Detection Coverage (Rooms, High Ceilings): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
4. Detection Coverage (Corridor, High Ceilings): Detect occupancy within 90 feet when mounted on a 10-foot-high ceiling.

D. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or a comparable product from the listed manufactures:

a. Watt Stopper: CI-200

2. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
3. Detection Coverage (Room, High Ceilings): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.

E. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or a comparable product from the listed manufactures:

a. Watt Stopper: WT Series

2. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s
3. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch-high ceiling.
4. Detection Coverage (Standard Rooms, Restrooms): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
5. Detection Coverage (Large Room, Restrooms): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch-high ceiling.
6. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot-high ceiling in a corridor not wider than 14 feet

F. Dual-Technology Type: Wall/Ceiling corner mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or a comparable product from the listed manufactures:

a. Watt Stopper: DT-200

2. Sensitivity Adjustment: Separate for each sensing technology.
3. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s

4. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.

G. Dual-Technology Type: Ceiling mounting 360 degree coverage; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or a comparable product from the listed manufactures:

a. Watt Stopper: DT-300

2. Sensitivity Adjustment: Separate for each sensing technology.
3. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s
4. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.

2.2 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Lighting.
2. Leviton Mfg. Company Inc.
3. Greengate
4. Watt Stopper.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft.
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: as shown on drawings
4. Voltage: Match the circuit voltage.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.3 DIGITAL TIMER LIGHT SWITCH

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Lighting.
2. Leviton Mfg. Company Inc.
3. Greengate
4. Watt Stopper.

B. Description: Combination digital timer and conventional switch lighting control unit. Switchbox-mounted, backlit LCD display, with selectable time interval in 10 minute increments.

1. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 amps at 277-V ac for ballast or LED, and 1/4 horsepower at 120-V ac.
2. Integral relay for connection to BAS.
3. Voltage: Match the circuit voltage.
4. Color: match wiring devices
5. Faceplate: Color matched to switch.

2.4 EMERGENCY SHUNT RELAY

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Lighting Control and Design, Inc.
2. Wattstopper.

B. Description: Normally closed, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924. Compatible with 0-10 volt LED dimmer such that fixtures controlled are brought to 100% output upon emergency operation.

1. Coil Rating: as required.

2.5 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 16 AWG. Comply with requirements in Division 26 Section "Conductors and Cables."

PART 3 - EXECUTION

3.1 OCCUPANCY SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

B. It shall be the contractor's responsibility to locate and aim sensors in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have ninety (90) to one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The

contractor shall provide additional sensors if required to properly and completely cover the respective room at no additional cost.

C. It is the contractor’s responsibility to arrange a pre-installation meeting with manufacturer's factory authorized representative, at owner's facility, to verify placement of sensors and installation criteria.

D. Proper judgment must be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The contractor shall also provide, at the owner's facility, the training necessary to familiarize the owner's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section "Conductors and Cables." Minimum conduit size shall be 1/2 inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Electrical Identification."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

C. Lighting control devices that fail tests and inspections are defective work.

3.6 FACTORY COMMISSIONING

A. Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustments and sensor placement to ensure a trouble-free occupancy-based lighting control system.

B. Upon completion of the system fine tuning the factory authorized technician shall provide the proper training to the owner's personnel in the adjustment, operation and maintenance of the sensors.

C. The electrical contractor shall provide the manufacturer, owner, architect and the electrical engineer with ten working days written notice of the scheduled commissioning date.

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.8 DEMONSTRATION

A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control system specified in Division 26 Section "Lighting Controls."

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Key interlock scheme drawing and sequence of operations.
9. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.3 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.7 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify **Owner** no fewer than three days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without **Owner's** written permission.
3. Comply with NFPA 70E.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 24 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Sector; Eaton Corporation.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Energy.
4. Square D; by Schneider Electric.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

F. Enclosures: Flush and Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.
c. Kitchen and Wash-Down Areas: NEMA 250, Type 4X.

2. Height: 84 inches maximum.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware. Eaton/Cutler Hammer – "EZTrim" is not acceptable.
4. Finishes:

a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Galvanized steel.

G. Incoming Mains:

1. Location: Top and/or bottom, as required for configurations shown on drawings.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

H. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

a. Plating shall run entire length of bus.
b. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

I. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

J. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices.

K. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Percentage of Future Space Capacity: Ten percent.

L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.2 POWER PANELBOARDS

A. Panelboards: NEMA PB 1, distribution type.

B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

C. Mains: Circuit breaker or Lugs only, as indicated on drawings.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

B. Mains: Circuit breaker or lugs only, as indicated on drawings.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Circuit Breakers:

a. RMS sensing.
b. Field-replaceable rating plug or electronic trip.
c. Digital display of settings, trip targets, and indicated metering displays.
d. Multi-button keypad to access programmable functions and monitored data.
e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
f. Integral test jack for connection to portable test set or laptop computer.
g. Field-Adjustable Settings:

1) Instantaneous trip.
2) Long- and short-time pickup levels.
3) Long and short time adjustments.
4) Ground-fault pickup level, time delay, and I squared T response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Subfeed Circuit Breakers: Vertically mounted.
9. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.
d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
f. Ground-Fault Protection: **Integrally mounted** relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage **without intentional** time delay.
h. Rating Plugs: Three-pole breakers with ampere ratings greater than **150** amperes shall have interchangeable rating plugs or electronic adjustable trip units.
i. Auxiliary Contacts: **One, SPDT switch** with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
j. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
k. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
l. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
m. Multipole units enclosed in a single housing with a single handle.
n. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in **on or off** position.
o. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

B. BREAKER APPLICATION

1. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

a. 400A frames and below: Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits.

b. 450 A frames and larger: Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

2.5 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NEMA PB 1.1.

D. Equipment Mounting:

1. Install panelboards on cast-in-place concrete equipment base(s), 4-inch nominal thickness. Comply with requirements for concrete base specified in Division 3 Section.
2. Attach panelboard to the vertical finished or structural surface behind the panelboard.

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Mount top of trim 90 inches above finished floor unless otherwise indicated.

G. Mount panelboard cabinet plumb and rigid without distortion of box.

H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

I. Mounting panelboards with space behind is recommended for damp, wet, or dirty locations. The steel slotted supports in the following paragraph provide an even mounting surface and the recommended space behind to prevent moisture or dirt collection.

J. Mount surface-mounted panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted supports vertically.

K. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.
2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

L. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

M. Install filler plates in unused spaces.

N. Stub four 1-inch empty conduits from all flush mounted panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

O. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Do not perform optional tests. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

DIVISION 26 – ELECTRICAL
SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Hospital-grade receptacles.
4. Toggle switches and wall-box dimmers.
5. Pendant cord-connector devices.
6. Cord and plug sets.

1.2 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

C. RFI: Radio-frequency interference.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. 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.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
2. Pass & Seymour/Legrand (Pass & Seymour).
3. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
4. Leviton Mfg. Company Inc. (Leviton).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

C. All devices shall be plug tail type.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. All 20A wiring devices shall be Pass and Seymour “PLUG-TAIL” type or equivalent by listed manufacturer.

D. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Hospital-Grade, Duplex Convenience Receptacles, 125 V, 20 A (ALL HOSPITAL DEVICES): Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
1. Products: Subject to compliance with requirements, provide products from as listed manufacturer equal to:
2.
    a. Pass & Seymour - PT 8300H (duplex with plug tail type)

b.

3. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.

2.4 GFCI RECEPTACLES

A. General Description:
1. Straight blade, feed non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Hospital-Grade, Duplex GFCI Convenience Receptacles, 125 V, 20 A (ALL HOSPITAL DEVICES): Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
1. Products: Subject to compliance with requirements, provide products from as listed manufacturer equal to:
a.
b. Pass & Seymour – PT 2095 HG (with plug tail).

2.5 PENDANT CORD-CONNECTOR DEVICES

A. Description:
1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.6 CORD AND PLUG SETS

A. Description:
1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.7 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:
1. Products: Subject to compliance with requirements, provide products from as listed manufacturer equal to:
a. Single Pole:
1) Pass & Seymour; PT 20AC1. (plug tail type)
2)
b. Three Way:

1) Pass & Seymour; PT 20AC3. (plug tail type)
2)

c. Four Way:
1) Pass & Seymour; PT 20AC4. (plug tail type)

2.8 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

2.9 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- thick, satin-finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.10 Device Color:
1. Wiring Devices Connected to Normal Power System: Gray - unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. Wiring Devices Connected to UPS Power System: Blue.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:
1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the bottom.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:
1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each wiring device (receptacle, switches, etc.) with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
   2. Test Instruments: Use instruments that comply with UL 1436.
   3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:
   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
   3. Ground Impedance: Values of up to 2 ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   5. Using the test plug, verify that the device and its outlet box are securely mounted.
   6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Test straight-blade convenience outlets in patient-care areas for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz..

D. Wiring device will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION

DIVISION 26 – ELECTRICAL
SECTION 26 28 13 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cartridge fuses rated 600-V ac and less for use in enclosed switches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
   1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
      a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
      b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
   2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
   3. Current-limitation curves for fuses with current-limiting characteristics.
   4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
   5. Coordination charts and tables and related data.
   6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
   1. Ambient temperature adjustment information.
   2. Current-limitation curves for fuses with current-limiting characteristics.
   3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
   4. Coordination charts and tables and related data.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Comply with UL 248-11 for plug fuses.

1.6 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.7 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Bussmann, Inc.
2. Edison Fuse, Inc.
3. Ferraz Shawmut, Inc.
4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

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

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:
1. Branch Circuits: Class RK1, time delay.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION

DIVISION 26 – ELECTRICAL
SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1.2 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
5. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

C. Manufacturer's field service report.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
   2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Submit on translucent log-log graph paper.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
   2. Fuse Pullers: Two for each size and type.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
   2. Altitude: Not exceeding 6600 feet.

1.10 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Siemens Energy & Automation, Inc.
   4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
   4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.2 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Products.
   2. General Electric Company.
   3. Siemens Energy & Automation, Inc.
   4. Square D; Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. 225A frames and below: Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits.

D. 250 A frames and larger: Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

a.
2. Instantaneous trip.
3. Long- and short-time pickup levels.
4. Long- and short-time time adjustments.
5. Ground-fault pickup level, time delay, and I^2t response.

E. Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen Areas: NEMA 250,, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated..

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

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

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:
1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:
1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:
    a. Initial Infrared Scanning: After Material Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Material Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Overcurrent Protective Device Coordination".

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 43 13 - SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

1.2 DEFINITIONS

A. Inominal: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SPD: Surge protective device.

H. VPR: Voltage protection rating.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For SPDs to include in maintenance manuals.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs 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 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with UL 1449.

D. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCE SUPPRESSOR

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Corporation.
2. Emerson Electric Co.
3. GE Zenith Controls.
4. PowerLogics, Inc.
5. Schneider Electric Industries SAS.
6. Siemens Industry, Inc.

B. SPDs: Comply with UL 1449, Type 2.

1. SPDs with the following features and accessories:
   a. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
   b. Indicator light display for protection status.
   c. Form-C contacts rated at 2 A and 24-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
   d. Surge counter.

C. Comply with UL 1283.

D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 480 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

E. Protection modes and UL 1449 VPR for grounded wye circuits with **208Y/120 V**, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: **700 V for 208Y/120 V**.
2. Line to Ground: **1200 V for 208Y/120 V**.
3. Line to Line: **1000 V for 208Y/120 V**.

F. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: [**700 V**] [**1000 V**].
3. Line to Line: 1000 V.

G. SCCR: Equal or exceed 200 kA.

H. Inominal Rating: 20 kA.

2.3 PANEL SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Corporation.
2. Emerson Electric Co.
3. GE Zenith Controls.
4. LEA International; Protection Technology Group.
5. Schneider Electric Industries SAS.
6. Siemens Industry, Inc.

B. SPDs: Comply with UL 1449, Type 2.

1. Include LED indicator lights for power and protection status.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Comply with UL 1283.

E. Protection modes and UL 1449 VPR for grounded wye circuits with **208Y/120 V**, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: **700 V for 208Y/120 V**.
2. Line to Ground: **700 V for 208Y/120 V**.
3. Neutral to Ground: **700 V for 208Y/120 V**.
4. Line to Line: **1200 V for 208Y/120 V**

F. Protection modes and UL 1449 VPR for 240/120-V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 700 V.
3. Neutral to Ground: 700 V.
4. Line to Line: 1200 V.

G. SCCR: Equal or exceed 200 kA.

H. Inominal Rating: 20 kA.

2.4 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

B. Outdoor Enclosures: NEMA 250, Type 3R.

2.5 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

B. Class 2 Control Cables: Multiconductor cable with copper conductors not smaller than No. 18 AWG, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cables: Multiconductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:

1. Power Wiring: Comply with wiring methods in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
2. Controls: Comply with wiring methods in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Compare equipment nameplate data for compliance with Drawings and Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 51 19 - LED INTERIOR AND EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

1.2 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. IP: International Protection or Ingress Protection Rating.

D. LED: Light-emitting diode.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests**, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project**.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.

2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

D. Mockups: For interior lighting luminaires in room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of luminaires in mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.8 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. Recessed Fixtures: Comply with NEMA LE 4.

D. Bulb shape complying with ANSI C79.1.

E. Lamp base complying with ANSI C81.61 or IEC 60061-1.

F. CRI of 80. CCT of 4100 K.

G. Rated lamp life of 50,000 hours.

H. Lamps dimmable from 100 percent to 0 percent of maximum light output.

I. Internal driver.

J. Nominal Operating Voltage: 120 V ac or 277 V ac.

1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

K. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear powder-coat finish.

2.3 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. **Prismatic acrylic**
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear powder-coat painted finish.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.4 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.5 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.

3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two 5/32-inch- diameter aircraft cable supports adjustable to 120 inches in length.
2. Ceiling mount with pendant mount with 5/32-inch diameter aircraft cable supports adjustable to 120 inches in length.
3. Ceiling mount with hook mount.

H. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing, rod or wire support for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

J. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 52 19 - EMERGENCY AND EXIT LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Emergency lighting units.
2. Exit signs.
3. Luminaire supports.

1.2 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.

D. Lumen: Measured output of lamp and luminaire, or both.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support.

1. Include data on features, accessories, and finishes.
2. Include physical description of the unit and dimensions.
3. Battery and charger for light units.
4. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
5. Include photometric data and adjustment factors based on laboratory tests, complying with IES LM-45, for each luminaire type.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule:

1. For emergency lighting units. Use same designations indicated on Drawings.
2. For exit signs. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
2. Luminaire-mounted, emergency battery pack: One for every 20 emergency lighting units. Furnish at least one of each type.
3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.8 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two year(s) from date of Substantial Completion.

B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Power Unit Batteries: 5 years from date of Substantial Completion. Full warranty shall apply for the entire warranty period.
2. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for the entire warranty period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.

C. Comply with NFPA 70 and NFPA 101.

D. Comply with NEMA LE 4 for recessed luminaires.

E. Comply with UL 1598 for fluorescent luminaires.

F. Lamp Base: Comply with ANSI C81.61 or IEC 60061-1.

G. Bulb Shape: Complying with ANSI C79.1.

2.3 EMERGENCY LIGHTING

A. General Requirements for Emergency Lighting Units: Self-contained units.

B. Emergency Luminaires:

1. Emergency Luminaires: as indicated on Drawings, with the following additional features:

   a. Operating at nominal voltage of 120 V ac and/or 277 V ac.
   b. Rated for installation in damp locations, and for sealed and gasketed luminaires in wet locations.

2.4 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Operating at nominal voltage of of 120 V ac and/or 277 V ac.
2. Lamps for AC Operation: LEDs; 50,000 hours minimum rated lamp life.
3. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.

2.5 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access:

1. Smooth operating, free of light leakage under operating conditions.
2. Designed to permit relamping without use of tools.
3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. **Prismatic glass**.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Acrylic: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

4. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

2.6 METAL FINISHES

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Support Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.

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

3.2 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire and emergency power unit weight.
2. Able to maintain luminaire position when testing emergency power unit.
3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.

E. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

F. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.

3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

G. Ceiling Grid Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Perform startup service:

1. Charge emergency power units and batteries minimum of one hour and depress switch to conduct short-duration test.
2. Charge emergency power units and batteries minimum of 24 hours and conduct one-hour discharge test.

3.6 ADJUSTING

A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:

1. Inspect all luminaires. Replace lamps, emergency power units, batteries, signs, or luminaires that are defective.

a. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

2. Conduct short-duration tests on all emergency lighting.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 27 05 11 - REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section, Requirements for Communications Installations, applies to all sections of Division 27.

B. Furnish and install communications cabling, systems, equipment, and accessories in accordance with the specifications and drawings. Capacities and ratings of transformers, cable, and other items and arrangements for the specified items are shown on drawings.

1.2 MINIMUM REQUIREMENTS

A. References to industry and trade association standards and codes are minimum installation requirement standards.

B. Drawings and other specification sections shall govern in those instances where requirements are greater than those specified in the above standards.

1.3 QUALIFICATIONS (PRODUCTS AND SERVICES)

A. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least three years.

B. Product Qualification:

1. Manufacturer's product shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years.
2. The Government reserves the right to require the Contractor to submit a list of installations where the products have been in operation before approval.

C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

1.4 MANUFACTURED PRODUCTS

A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts shall be available.

B. When more than one unit of the same class of equipment is required, such units shall be the product of a single manufacturer.

C. Equipment Assemblies and Components:

1. Components of an assembled unit need not be products of the same manufacturer.
2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
3. Components shall be compatible with each other and with the total assembly for the intended service.

4. Constituent parts which are similar shall be the product of a single manufacturer.

D. Factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.

E. When Factory Testing Is Specified:

1. The Government shall have the option of witnessing factory tests. The contractor shall notify the VA through the Resident Engineer a minimum of 15 working days prior to the manufacturers making the factory tests.
2. Four copies of certified test reports containing all test data shall be furnished to the Resident Engineer prior to final inspection and not more than 90 days after completion of the tests.
3. When equipment fails to meet factory test and re-inspection is required, the contractor shall be liable for all additional expenses, including expenses of the Government.

1.5 EQUIPMENT REQUIREMENTS

Where variations from the contract requirements are requested in accordance with the GENERAL CONDITIONS and Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, the connecting work and related components shall include, but not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.

1.6 EQUIPMENT PROTECTION

A. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain:

1. During installation, enclosures, equipment, controls, controllers, circuit protective devices, and other like items, shall be protected against entry of foreign matter; and be vacuum cleaned both inside and outside before testing and operating and repainting if required.
2. Damaged equipment shall be, as determined by the Resident Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.
3. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
4. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.7 WORK PERFORMANCE

A. Job site safety and worker safety is the responsibility of the contractor.

B. For work on existing stations, arrange, phase and perform work to assure communications service for other buildings at all times. Refer to Article OPERATIONS AND STORAGE AREAS under Section 01 00 00, GENERAL REQUIREMENTS.

C. New work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Section 01 00 00, GENERAL REQUIREMENTS.

D. Coordinate location of equipment and pathways with other trades to minimize interferences. See the GENERAL CONDITIONS.

1.8 EQUIPMENT INSTALLATION AND REQUIREMENTS

A. Equipment location shall be as close as practical to locations shown on the drawings.

B. Inaccessible Equipment:

1. Where the Government determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.
2. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.

1.9 EQUIPMENT IDENTIFICATION

A. Install an identification sign which clearly indicates information required for use and maintenance of equipment.

B. Nameplates shall be laminated black phenolic resin with a white core with engraved lettering, a minimum of 6 mm (1/4 inch) high. Secure nameplates with screws. Nameplates that are furnished by manufacturer as a standard catalog item, or where other method of identification is herein specified, are exceptions.

1.10 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. The Government's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage, or installation of equipment or material which has not had prior approval will not be permitted at the job site.

C. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings, and other data necessary for the Government to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.

D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.

1. Mark the submittals, "SUBMITTED UNDER SECTION_____".
2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
3. Submit each section separately.

E. The submittals shall include the following:

1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.
2. Submittals are required for all equipment anchors and supports. Submittals shall include weights, dimensions, center of gravity, standard connections, manufacturer's recommendations and behavior

problems (e.g., vibration, thermal expansion,) associated with equipment or piping so that the proposed installation can be properly reviewed.

3. Elementary and interconnection wiring diagrams for communication and signal systems, control system and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
4. Parts list which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.

F. Manuals: Submit in accordance with Section 01 00 00, GENERAL REQUIREMENTS.

1. Maintenance and Operation Manuals: Submit as required for systems and equipment specified in the technical sections. Furnish four copies, bound in hardback binders, (manufacturer's standard binders) or an approved equivalent. Furnish one complete manual as specified in the technical section but in no case later than prior to performance of systems or equipment test, and furnish the remaining manuals prior to contract completion.
2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, equipment, building, name of Contractor, and contract number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the system or equipment.
3. Provide a "Table of Contents" and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
4. The manuals shall include:
    a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
    b. A control sequence describing start-up, operation, and shutdown.
    c. Description of the function of each principal item of equipment.
    d. Installation and maintenance instructions.
    e. Safety precautions.
    f. Diagrams and illustrations.
    g. Testing methods.
    h. Performance data.
    i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
    j. Appendix; list qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.

G. Approvals will be based on complete submission of manuals together with shop drawings.

H. After approval and prior to installation, furnish the Resident Engineer with one sample of each of the following:
   1. A 300 mm (12 inch) length of each type and size of wire and cable along with the tag from the coils of reels from which the samples were taken.
   2. Each type of conduit and pathway coupling, bushing and termination fitting.
   3. Raceway and pathway hangers, clamps and supports.
   4. Duct sealing compound.

I. In addition to the requirement of SUBMITTALS, the VA reserves the right to request the manufacturer to arrange for a VA representative to see typical active systems in operation, when there has been no prior experience with the manufacturer or the type of equipment being submitted.

1.11 SINGULAR NUMBER

Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

1.12 TRAINING

A. Training shall be provided in accordance with Article, INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.

B. Training shall be provided for the particular equipment or system as required in each associated specification.

C. A training schedule shall be developed and submitted by the contractor and approved by the Resident Engineer at least 30 days prior to the planned training.

END OF SECTION

DIVISION 27 - ELECTRICAL
SECTION 27 05 26 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies general grounding and bonding requirements of telecommunication installations for equipment operations.

B. “Grounding electrode system” refers to all electrodes required by NEC, as well as including made, supplementary, telecommunications system grounding electrodes.

C. The terms “connect” and “bond” are used interchangeably in this specification and have the same meaning.

1.2 RELATED WORK

A. Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 27.

B. Section 27 10 00, STRUCTURED CABLING: Low Voltage power and lighting wiring.

C. Section 26 41 00, FACILITY LIGHTNING PROTECTION: Requirements for a lightning protection system.

1.3 SUBMITTALS

A. Submit in accordance with Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.

B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include the location of system grounding electrode connections and the routing of aboveground and underground grounding electrode conductors.

C. Test Reports: Provide certified test reports of ground resistance.

D. Certifications: Two weeks prior to final inspection, submit four copies of the following to the Resident Engineer:

1. Certification that the materials and installation is in accordance with the drawings and specifications.
2. Certification, by the Contractor, that the complete installation has been properly installed and tested.

1.4 APPLICABLE PUBLICATIONS

Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.

A. American Society for Testing and Materials (ASTM):

B1-2001.....Standard Specification for Hard-Drawn Copper Wire

B8-2004.....Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

B. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

81-1983 .....IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

C. National Fire Protection Association (NFPA):

70-2005 .....National Electrical Code (NEC)

D. Telecommunications Industry Association, (TIA)

J-STO-607-A-2002.....Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

E. Underwriters Laboratories, Inc. (UL):

44-2005 .....Thermoset-Insulated Wires and Cables

83-2003 .....Thermoplastic-Insulated Wires and Cables

467-2004 .....Grounding and Bonding Equipment

486A-486B-2003 .....Wire Connectors

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

A. Equipment grounding conductors shall be UL 83 insulated stranded copper, except that sizes 6 mm² (10 AWG) and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes 25 mm² (4 AWG) and larger shall be permitted to be identified per NEC.

B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes 6 mm² (10 AWG) and smaller shall be ASTM B1 solid bare copper wire.

C. Isolated Power System: Type XHHW-2 insulation with a dielectric constant of 3.5 or less.

D. Telecom System Grounding Riser Conductor: Telecommunications Grounding Riser shall be in accordance with J STO-607A. Use a minimum 50mm² (1/0 AWG) insulated stranded copper grounding conductor unless indicated otherwise.

2.2 GROUND RODS

A. Copper clad steel, 19 mm (3/4-inch) diameter by 3000 mm (10 feet) long, conforming to UL 467.

B. Quantity of rods shall be as required to obtain the specified ground resistance.

2.3 SPLICES AND TERMINATION COMPONENTS

Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).

2.4 TELECOMMUNICATION SYSTEM GROUND BUSBARS

A. Provide solid copper busbar, pre-drilled from two-hole lug connections with a minimum thickness of 6 mm (1/4 inch) for wall and backboard mounting using standard insulators sized as follows:

1. Room Signal Grounding: 300 mm x 100 mm (12 inches x 4 inch).
2. Master Signal Ground: 600 mm x 100 mm (24 inches x 4 inch).

2.5 GROUND CONNECTIONS

A. Below Grade: Exothermic-welded type connectors.

B. Above Grade:

1. Bonding Jumpers: compression type connectors, using zinc-plated fasteners and external tooth lockwashers.
2. Ground Busbars: Two-hole compression type lugs using tin-plated copper or copper alloy bolts and nuts.
3. Rack and Cabinet Ground Bars: one-hole compression-type lugs using zinc-plated or copper alloy fasteners.

A. Cable Shields: Make ground connections to multipair communications cables with metallic shields using shield bonding connectors with screw stud connection.

2.6 EQUIPMENT RACK AND CABINET GROUND BARS

Provide solid copper ground bars designed for mounting on the framework of open or cabinet-enclosed equipment racks with minimum dimensions of 4 mm thick by 19 mm wide (3/8 inch x ¾ inch).

2.7 GROUND TERMINAL BLOCKS

At any equipment mounting location (e.g. backboards and hinged cover enclosures) where rack-type ground bars cannot be mounted, provide screw lug-type terminal blocks.

2.8 SPLICE CASE GROUND ACCESSORIES

Splice case grounding and bonding accessories shall be supplied by the splice case manufacturer when available. Otherwise, use 16 mm² (6 AWG) insulated ground wire with shield bonding connectors.

PART 3 - EXECUTION

3.1 GENERAL

A. Ground in accordance with the NEC, as shown on drawings, and as hereinafter specified.

B. System Grounding:

1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformers.
2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.
3. Isolation transformers and isolated power systems shall not be system grounded.

C. Equipment Grounding: Metallic structures (including ductwork and building steel), enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be bonded and grounded.

3.2 INACCESSIBLE GROUNDING CONNECTIONS

Make grounding connections, which are buried or otherwise normally inaccessible (except connections for which periodic testing access is required) by exothermic weld.

3.3 SECONDARY EQUIPMENT AND CIRCUITS

A. Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.

B. Metallic Piping, Building Steel, and Supplemental Electrode(s):
   1. Provide a grounding electrode conductor sized per NEC between the service equipment ground bus and all metallic water and gas pipe systems, building steel, and supplemental or made electrodes. Jumper insulating joints in the metallic piping. All connections to electrodes shall be made with fittings that conform to UL 467.
   2. Provide a supplemental ground electrode and bond to the grounding electrode system.

F. Conduit Systems:
   1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor.
   2. Non-metallic conduit systems shall contain an equipment grounding conductor, except that non-metallic feeder conduits which carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment need not contain an equipment grounding conductor.
   3. Conduit containing only a grounding conductor, and which is provided for mechanical protection of the conductor, shall be bonded to that conductor at the entrance and exit from the conduit.

G. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders and power and lighting branch circuits.

H. Boxes, Cabinets, Enclosures, and Panelboards:
   1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes (except for special grounding systems for intensive care units and other critical units shown).
   2. Provide lugs in each box and enclosure for equipment grounding conductor termination.
   3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.

J. Receptacles shall not be grounded through their mounting screws. Ground with a jumper from the receptacle green ground terminal to the device box ground screw and the branch circuit equipment grounding conductor.

M. Raised Floors: Provide bonding of all raised floor components.

3.4 CORROSION INHIBITORS

When making ground and ground bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

3.5 CONDUCTIVE PIPING

A. Bond all conductive piping systems, interior and exterior, to the building to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.

B. In operating rooms and at intensive care and coronary care type beds, bond the gases and suction piping, at the outlets, directly to the room or patient ground bus.

3.6 TELECOMMUNICATIONS SYSTEM

A. Bond telecommunications system grounding equipment to the electrical grounding electrode system.

B. Furnish and install all wire and hardware required to properly ground, bond and connect communications raceway, cable tray, metallic cable shields, and equipment to a ground source.

C. Ground bonding jumpers shall be continuous with no splices. Use the shortest length of bonding jumper possible.

D. Provide ground paths that are permanent and continuous with a resistance of 1 ohm or less from raceway, cable tray, and equipment connections to the building grounding electrode. The resistance across individual bonding connections shall be 10 milli ohms or less.

E. Below-Grade Grounding Connections: When making exothermic welds, wire brush or file the point of contact to a bare metal surface. Use exothermic welding cartridges and molds in accordance with the manufacturer's recommendations. After welds have been made and cooled, brush slag from the weld area and thoroughly cleaned the joint area. Notify the Resident Engineer prior to backfilling any ground connections.

F. Above-Grade Grounding Connections: When making bolted or screwed connections to attach bonding jumpers, remove paint to expose the entire contact surface by grinding where necessary; thoroughly clean all connector, plate and other contact surfaces; and apply an appropriate corrosion inhibitor to all surfaces before joining.

G. Bonding Jumpers:

1. Use insulated ground wire of the size and type shown on the Drawings or use a minimum of 16 mm^2 (6 AWG) insulated copper wire.
2. Assemble bonding jumpers using insulated ground wire terminated with compression connectors.
3. Use compression connectors of proper size for conductors specified. Use connector manufacturer's compression tool.

H. Bonding Jumper Fasteners:

1. Conduit: Fasten bonding jumpers using screw lugs on grounding bushings or conduit strut clamps, or the clamp pads on push-type conduit fasteners. When screw lug connection to a conduit strut clamp is not possible, fasten the plain end of a bonding jumper wire by slipping the plain end under the conduit strut clamp pad; tighten the clamp screw firmly. Where appropriate, use zinc-plated external tooth lockwashers.
2. Wireway and Cable Tray: Fasten bonding jumpers using zinc-plated bolts, external tooth lockwashers, and nuts. Install protective cover, e.g., zinc-plated acorn nuts on any bolts extending into wireway or cable tray to prevent cable damage.
3. Ground Plates and Busbars: Fasten bonding jumpers using two-hole compression lugs. Use tin-plated copper or copper alloy bolts, external tooth lockwashers, and nuts.
4. Unistrut and Raised Floor Stringers: Fasten bonding jumpers using zinc-plated, self-drill screws and external tooth lockwashers.

3.7 COMMUNICATION ROOM GROUNDING

A. Telecommunications Ground Busbars:
   1. Provide communications room telecommunications ground busbar hardware at 950 mm (18 inches) at locations indicated on the Drawings.
   2. Connect the telecommunications room ground busbars to other room grounding busbars as indicated on the Grounding Riser diagram.

B. Telephone-Type Cable Rack Systems: aluminum pan installed on telephone-type cable rack serves as the primary ground conductor within the communications room. Make ground connections by installing the following bonding jumpers:
   1. Install a 16 mm² (6 AWG) bonding between the telecommunications ground busbar and the nearest access to the aluminum pan installed on the cable rack.
   2. Use 16 mm² (6 AWG) bonding jumpers across aluminum pan junctions.

C. Self-Supporting and Cabinet-Mounted Equipment Rack Ground Bars:
   1. When ground bars are provided at the rear of lineup of bolted together equipment racks, bond the copper ground bars together using solid copper splice plates supplied by the ground bar manufacturer.
   2. Bond together nonadjacent ground bars on equipment racks and cabinets with 16 mm² (6 AWG) insulated copper wire bonding jumpers attached at each end with compression-type connectors and mounting bolts.
   3. Provide a 16 mm² (6 AWG) bonding jumper between the rack and/or cabinet ground busbar and the aluminum pan of an overhead cable tray or the raised floor stringer as appropriate.

D. Backboards: Provide a screw lug-type terminal block or drilled and tapped copper strip near the top of backboards used for communications cross-connect systems. Connect backboard ground terminals to the aluminum pan in the telephone-type cable tray using an insulated 16 mm² (16 AWG) bonding jumper.

E. Other Communication Room Ground Systems: Ground all metallic conduit, wireways, and other metallic equipment located away from equipment racks or cabinets to the cable tray pan or the telecommunications ground busbar, whichever is closer, using insulated 16 mm² (6 AWG) ground wire bonding jumpers.

3.8 COMMUNICATIONS CABLE GROUNDING

A. Bond all metallic cable sheaths in multipair communications cables together at each splicing and/or terminating location to provide 100 percent metallic sheath continuity throughout the communications distribution system.
   1. At terminal points, install a cable shield bonding connector provide a screw stud connection for ground wire. Use a bonding jumper to connect the cable shield connector to an appropriate ground source like the rack or cabinet ground bar.
   2. Bond all metallic cable shields together within splice closures using cable shield bonding connectors or the splice case grounding and bonding accessories provided by the splice case manufacturer. When an external ground connection is provided as part of splice closure, connect to an approved ground source and all other metallic components and equipment at that location.

3.9 COMMUNICATIONS CABLE TRAY SYSTEMS:

A. Bond the metallic structures of one cable tray in each tray run following the same path to provide 100 percent electrical continuity throughout this cable tray systems as follows:
   1. Splice plates provided by the cable tray manufacturer can be used for providing a ground bonding connection between cable tray sections when the resistance across a bolted connection is 10 milliohms or less. The Subcontractor shall verify this loss by testing across one slice plate connection in the presence of the Contractor.
   2. Install a 16 mm² (6 AWG) bonding jumper across each cable tray splice or junction where splice plates cannot be used.
   3. When cable tray terminations to cable rack, install 16 mm² (6 AWG) bonding jumper between cable tray and cable rank pan.

3.10 COMMUNCIATIONS RACEWAY GROUNDING

A. Conduit: Use insulated 16 mm² (6 AWG) bonding jumpers to ground metallic conduit at each end and to bond at all intermediate metallic enclosures.

B. Wireway: use insulated 16 mm² (6 AWG) bonding jumpers to ground or bond metallic wireway at each end at all intermediate metallic enclosures and across all section junctions.

C. Cable Tray Systems: Use insulated 16 mm² (6 AWG) bonding jumpers to ground cable tray to column-mounted building ground plates (pads) at each end and approximately every 16 meters (50 feet).

3.11 GROUND RESISTANCE

A. Grounding system resistance to ground shall not exceed 5 ohms. Make necessary modifications or additions to the grounding electrode system for compliance without additional cost to the Government. Final tests shall assure that this requirement is met.

B. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in IEEE 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

C. Services at power company interface points shall comply with the power company ground resistance requirements.

D. Below-grade connections shall be visually inspected by the Resident Engineer prior to backfilling. The Contractor shall notify the Resident Engineer 24 hours before the connections are ready for inspection.

3.12 GROUND ROD INSTALLATION

A. Drive each rod vertically in the earth, not less than 3000 mm (10 feet) in depth.

B. Where permanently concealed ground connections are required, make the connections by the exothermic process to form solid metal joints. Make accessible ground connections with mechanical pressure type ground connectors.

C. Where rock prevents the driving of vertical ground rods, install angled ground rods or grounding electrodes in horizontal trenches to achieve the specified resistance.

END OF SECTION

DIVISION 27 - ELECTRICAL
SECTION 27 05 33 - RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, and connection of conduit, fittings, and boxes to form complete, coordinated, raceway systems. Raceways are required for all communications cabling unless shown or specified otherwise.

B. Definitions: The term conduit, as used in this specification, shall mean any or all of the raceway types specified.

1.2 RELATED WORK

A. Bedding of conduits: Section 31 20 00, EARTH MOVING.

B. Mounting board for communication closets: Section 06 10 00, ROUGH CARPENTRY.

C. Sealing around penetrations to maintain the integrity of fire rated construction: Section 07 84 00, FIRESTOPPING.

D. Fabrications for the deflection of water away from the building envelope at penetrations: Section 07 60 00, FLASHING AND SHEET METAL.

E. Sealing around conduit penetrations through the building envelope to prevent moisture migration into the building: Section 07 92 00, JOINT SEALANTS.

F. Identification and painting of conduit and other devices: Section 09 91 00, PAINTING.

G. General electrical requirements and items that is common to more than one section of Division 27: Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.

H. Requirements for personnel safety and to provide a low impedance path for possible ground fault currents: Section 27 05 26, GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS.

1.3 SUBMITTALS

In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:

A. Shop Drawings:

1. Size and location of panels and pull boxes
2. Layout of required conduit penetrations through structural elements.
3. The specific item proposed and its area of application shall be identified on the catalog cuts.

B. Certification: Prior to final inspection, deliver to the Resident Engineer four copies of the certification that the material is in accordance with the drawings and specifications and has been properly installed.

1.4 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.

B. National Fire Protection Association (NFPA):

70-05 .....National Electrical Code (NEC)

C. Underwriters Laboratories, Inc. (UL):

1-03 .....Flexible Metal Conduit

5-01 .....Surface Metal Raceway and Fittings

6-03 .....Rigid Metal Conduit

50-03 .....Enclosures for Electrical Equipment

360-03 .....Liquid-Tight Flexible Steel Conduit

467-01 .....Grounding and Bonding Equipment

514A-01.....Metallic Outlet Boxes

514B-02.....Fittings for Cable and Conduit

514C-05.....Nonmetallic Outlet Boxes, Flush-Device Boxes and Covers

651-02 .....Schedule 40 and 80 Rigid PVC Conduit

651A-03.....Type EB and A Rigid PVC Conduit and HDPE Conduit

797-03 .....Electrical Metallic Tubing

1242-00 .....Intermediate Metal Conduit

D. National Electrical Manufacturers Association (NEMA):

TC-3-04.....PVC Fittings for Use with Rigid PVC Conduit and Tubing

FB1-03.....Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable

PART 2 - PRODUCTS

2.1 MATERIAL

A. Conduit Size: In accordance with the NEC, but not less than 13 mm (1/2 inch) unless otherwise shown. Where permitted by the NEC, 13 mm (1/2 inch) flexible conduit may be used for tap connections to recessed lighting fixtures.

B. Conduit:

1. Rigid galvanized steel: Shall Conform to UL 6, ANSI C80.1.
2. Rigid aluminum: Shall Conform to UL 6A, ANSI C80.5.
3. Rigid intermediate steel conduit (IMC): Shall Conform to UL 1242, ANSI C80.6.
4. Electrical metallic tubing (EMT): Shall Conform to UL 797, ANSI C80.3. Maximum size not to exceed 105 mm (4 inch) and shall be permitted only with cable rated 600 volts or less.
5. Flexible galvanized steel conduit: Shall Conform to UL 1.
6. Liquid-tight flexible metal conduit: Shall Conform to UL 360.
7. Direct burial plastic conduit: Shall conform to UL 651 and UL 651A, heavy wall PVC or high density polyethylene (PE).
8. Surface metal raceway: Shall Conform to UL 5.

C. Conduit Fittings:

1. Rigid steel and IMC conduit fittings:
    a. Fittings shall meet the requirements of UL 514B and ANSI/ NEMA FB1.
    a. Standard threaded couplings, locknuts, bushings, and elbows: Only steel or malleable iron materials are acceptable. Integral retractable type IMC couplings are also acceptable.
    b. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.
    c. Bushings: Metallic insulating type, consisting of an insulating insert molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
    d. Erickson (union-type) and set screw type couplings: Approved for use in concrete are permitted for use to complete a conduit run where conduit is installed in concrete. Use set screws of case hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.
    e. Sealing fittings: Threaded cast iron type. Use continuous drain type sealing fittings to prevent passage of water vapor. In concealed work, install fittings in flush steel boxes with blank cover plates having the same finishes as that of other electrical plates in the room.
2. Rigid aluminum conduit fittings:
    a. Standard threaded couplings, locknuts, bushings, and elbows: Malleable iron, steel or aluminum alloy materials; Zinc or cadmium plate iron or steel fittings. Aluminum fittings containing more than 0.4 percent copper are prohibited.
    b. Locknuts and bushings: As specified for rigid steel and IMC conduit.
    c. Set screw fittings: Not permitted for use with aluminum conduit.
3. Electrical metallic tubing fittings:
    a. Fittings shall meet the requirements of UL 514B and ANSI/ NEMA FB1.
    b. Only steel or malleable iron materials are acceptable.
    c. Couplings and connectors: Concrete tight and rain tight, with connectors having insulated throats. Use gland and ring compression type couplings and connectors for conduit sizes 50 mm (2 inches) and smaller. Use set screw type couplings with four set screws each for conduit sizes over 50 mm (2 inches). Use set screws of case-hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding.
    d. Indent type connectors or couplings are prohibited.
    e. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are prohibited.
4. Flexible steel conduit fittings:
    a. Conform to UL 514B. Only steel or malleable iron materials are acceptable.
    b. Clamp type, with insulated throat.
5. Liquid-tight flexible metal conduit fittings:
    a. Fittings shall meet the requirements of UL 514B and ANSI/ NEMA FB1.
    b. Only steel or malleable iron materials are acceptable.

c. Fittings must incorporate a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening. Connectors shall have insulated throats.

6. Direct burial plastic conduit fittings:
   a. Fittings shall meet the requirements of UL 514C and NEMA TC3.
   b. As recommended by the conduit manufacturer.
7. Surface metal raceway fittings: As recommended by the raceway manufacturer.
8. Expansion and deflection couplings:
   a. Conform to UL 467 and UL 514B.
   b. Accommodate, 19 mm (0.75 inch) deflection, expansion, or contraction in any direction, and allow 30 degree angular deflections.
   c. Include internal flexible metal braid sized to guarantee conduit ground continuity and fault currents in accordance with UL 467, and the NEC code tables for ground conductors.
   d. Jacket: Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber material with stainless steel jacket clamps.

D. Conduit Supports:
1. Parts and hardware: Zinc-coat or provide equivalent corrosion protection.
2. Individual Conduit Hangers: Designed for the purpose, having a pre-assembled closure bolt and nut, and provisions for receiving a hanger rod.
3. Multiple conduit (trapeze) hangers: Not less than 38 mm by 38 mm (1-1/2 by 1-1/2 inch), 12 gage steel, cold formed, lipped channels; with not less than 9 mm (3/8 inch) diameter steel hanger rods.
4. Solid Masonry and Concrete Anchors: Self-drilling expansion shields, or machine bolt expansion.

E. Outlet, Junction, and Pull Boxes:
1. UL-50 and UL-514A.
2. Cast metal where required by the NEC or shown, and equipped with rustproof boxes.
3. Sheet metal boxes: Galvanized steel, except where otherwise shown.
4. Flush mounted wall or ceiling boxes shall be installed with raised covers so that front face of raised cover is flush with the wall. Surface mounted wall or ceiling boxes shall be installed with surface style flat or raised covers.

F. Wireways: Equip with hinged covers, except where removable covers are shown.

G. Warning Tape: Standard, 4-Mil polyethylene 76 mm (3 inch) wide tape detectable type, red with black letters, and imprinted with “CAUTION BURIED COMMUNICATIONS CABLE BELOW”.

PART 3 - EXECUTION

3.1 PENETRATIONS

A. Cutting or Holes:
1. Locate holes in advance where they are proposed in the structural sections such as ribs or beams. Obtain the approval of the Resident Engineer prior to drilling through structural sections.

2. Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted by the Resident Engineer as required by limited working space.

B. Fire Stop: Where conduits, wireways, and other communications raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING, with rock wool fiber or silicone foam sealant only. Completely fill and seal clearances between raceways and openings with the fire stop material.

C. Waterproofing: At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight as specified in Section 07 92 00, JOINT SEALANTS.

3.2 INSTALLATION, GENERAL

A. Install conduit as follows:

1. In complete runs before pulling in cables or wires.
2. Flattened, dented, or deformed conduit is not permitted. Remove and replace the damaged conduits with new undamaged material.
3. Assure conduit installation does not encroach into the ceiling height head room, walkways, or doorways.
4. Cut square with a hacksaw, ream, remove burrs, and draw up tight.
5. Mechanically continuous.
6. Independently support conduit at 8’0” on center. Do not use other supports i.e., (suspended ceilings, suspended ceiling supporting members, lighting fixtures, conduits, mechanical piping, or mechanical ducts).
7. Support within 300 mm (1 foot) of changes of direction, and within 300 mm (1 foot) of each enclosure to which connected.
8. Close ends of empty conduit with plugs or caps at the rough-in stage to prevent entry of debris, until wires are pulled in.
9. Conduit installations under fume and vent hoods are prohibited.
10. Secure conduits to cabinets, junction boxes, pull boxes and outlet boxes with bonding type locknuts. For rigid and IMC conduit installations, provide a locknut on the inside of the enclosure, made up wrench tight. Do not make conduit connections to junction box covers.
11. Flashing of penetrations of the roof membrane is specified in Section 07 60 00, FLASHING AND SHEET METAL.
12. Do not use aluminum conduits in wet locations.
13. Unless otherwise indicated on the drawings or specified herein, all conduits shall be installed concealed within finished walls, floors and ceilings.

B. Conduit Bends:

1. Make bends with standard conduit bending machines.

2. Conduit hickey may be used for slight offsets, and for straightening stubbed out conduits.
3. Bending of conduits with a pipe tee or vise is prohibited.

C. Layout and Homeruns:

2. Deviations: Make only where necessary to avoid interferences and only after drawings showing the proposed deviations have been submitted approved by the Resident Engineer.

3.3 CONCEALED WORK INSTALLATION

A. In Concrete:

1. Conduit: Rigid steel, IMC or EMT. Do not install EMT in concrete slabs that are in contact with soil, gravel or vapor barriers.
2. Align and run conduit in direct lines.
3. Install conduit through concrete beams only when the following occurs:
   a. Where shown on the structural drawings.
   b. As approved by the Resident Engineer prior to construction, and after submittal of drawing showing location, size, and position of each penetration.
4. Installation of conduit in concrete that is less than 75 mm (3 inches) thick is prohibited.
   a. Conduit outside diameter larger than 1/3 of the slab thickness is prohibited.
   b. Space between conduits in slabs: Approximately six conduit diameters apart, except one conduit diameter at conduit crossings.
   c. Install conduits approximately in the center of the slab so that there will be a minimum of 19 mm (3/4 inch) of concrete around the conduits.
5. Make couplings and connections watertight. Use thread compounds that are UL approved conductive type to insure low resistance ground continuity through the conduits. Tightening set screws with pliers is prohibited.

B. Furred or Suspended Ceilings and in Walls:

1. Conduit for conductors above 600 volts:
   a. Rigid steel or rigid aluminum.
   b. Aluminum conduit mixed indiscriminately with other types in the same system is prohibited.
2. Conduit for conductors 600 volts and below:
   a. Rigid steel, IMC, rigid aluminum, or EMT. Different type conduits mixed indiscriminately in the same system is prohibited.
3. Align and run conduit parallel or perpendicular to the building lines.
4. Connect recessed lighting fixtures to conduit runs with maximum 1800 mm (six feet) of flexible metal conduit extending from a junction box to the fixture.
5. Tightening set screws with pliers is prohibited.

3.4 EXPOSED WORK INSTALLATION

A. Unless otherwise indicated on the drawings, exposed conduit is only permitted in mechanical and electrical rooms.

B. Conduit for conductors above 600 volts:
   1. Rigid steel or rigid aluminum.
   2. Aluminum conduit mixed indiscriminately with other types in the same system is prohibited.
C. Conduit for Conductors 600 volts and below:
   1. Rigid steel, IMC, rigid aluminum, or EMT. Different type of conduits mixed indiscriminately in the system is prohibited.
D. Align and run conduit parallel or perpendicular to the building lines.
E. Install horizontal runs close to the ceiling or beams and secure with conduit straps.
F. Support horizontal or vertical runs at not over 2400 mm (eight foot) intervals.
G. Surface metal raceways: Use only where shown.
H. Painting:
   1. Paint exposed conduit as specified in Section09 91 00, PAINTING.
   2. Paint all conduits containing cables rated over 600 volts safety orange. Refer to Section 09 91 00, PAINTING for preparation, paint type, and exact color. In addition, paint legends, using 50 mm (two inch) high black numerals and letters, showing the cable voltage rating. Provide legends where conduits pass through walls and floors and at maximum 6000 mm (20 foot) intervals in between.

3.5 EXPANSION JOINTS

A. Conduits 75 mm (3 inches) and larger, that are secured to the building structure on opposite sides of a building expansion joint, require expansion and deflection couplings. Install the couplings in accordance with the manufacturer's recommendations.
B. Provide conduits smaller than 75 mm (3 inches) with junction boxes on both sides of the expansion joint. Connect conduits to junction boxes with sufficient slack of flexible conduit to produce 125 mm (5 inch) vertical drop midway between the ends. Flexible conduit shall have a copper green ground bonding jumper installed. In lieu of this flexible conduit, expansion and deflection couplings as specified above for 375 mm (15 inches) and larger conduits are acceptable.
C. Install expansion and deflection couplings where shown.

D. Seismic Areas: In seismic areas, provide conduits rigidly secured to the building structure on opposite sides of a building expansion joint with junction boxes on both sides of the joint. Connect conduits to junction boxes with 375 mm (15 inches) of slack flexible conduit. Flexible conduit shall have a copper green ground bonding jumper installed.

3.6 CONDUIT SUPPORTS, INSTALLATION

A. Safe working load shall not exceed 1/4 of proof test load of fastening devices.
B. Use pipe straps or individual conduit hangers for supporting individual conduits. Maximum distance between supports is 2.5 m (8 foot) on center.
C. Support multiple conduit runs with trapeze hangers. Use trapeze hangers that are designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger itself, and 90 kg (200 pounds). Attach each conduit with U-bolts or other approved fasteners.

D. Support conduit independently of junction boxes, pull boxes, fixtures, suspended ceiling T-bars, angle supports, and similar items.

E. Fasteners and Supports in Solid Masonry and Concrete:

1. New Construction: Use steel or malleable iron concrete inserts set in place prior to placing the concrete.
2. Existing Construction:
   a. Steel expansion anchors not less than 6 mm (1/4 inch) bolt size and not less than 28 mm (1-1/8 inch) embedment.
   b. Power set fasteners not less than 6 mm (1/4 inch) diameter with depth of penetration not less than 75 mm (3 inches).
   c. Use vibration and shock resistant anchors and fasteners for attaching to concrete ceilings.

F. Hollow Masonry: Toggle bolts are permitted.

G. Bolts supported only by plaster or gypsum wallboard are not acceptable.

H. Metal Structures: Use machine screw fasteners or other devices specifically designed and approved for the application.

I. Attachment by wood plugs, rawl plug, plastic, lead or soft metal anchors, or wood blocking and bolts supported only by plaster is prohibited.

J. Chain, wire, or perforated strap shall not be used to support or fasten conduit.

K. Spring steel type supports or fasteners are prohibited for all uses except: Horizontal and vertical supports/fasteners within walls.

L. Vertical Supports: Vertical conduit runs shall have riser clamps and supports in accordance with the NEC and as shown. Provide supports for cable and wire with fittings that include internal wedges and retaining collars.

3.7 BOX INSTALLATION

A. Boxes for Concealed Conduits:

1. Flush mounted.
2. Provide raised covers for boxes to suit the wall or ceiling, construction and finish.

B. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling in operations.

C. Remove only knockouts as required and plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.

D. Stencil or install phenolic nameplates on covers of the boxes identified on riser diagrams; for example "SIG-FA JB No. 1".

3.11 COMMUNICATION SYSTEM CONDUIT

A. Install the communication raceway system as shown on drawings.

B. Minimum conduit size of 19 mm (3/4 inch), but not less than the size shown on the drawings.

C. All conduit ends shall be equipped with insulated bushings.

D. All 100 mm (four inch) conduits within buildings shall include pull boxes after every two 90 degree bends. Size boxes per the NEC.

E. Vertical conduits/sleeves through closets floors shall terminate not less than 75 mm (3 inches) below the floor and not less than 75 mm (3 inches) below the ceiling of the floor below.

F. Terminate conduit runs to/from a backboard in a closet or interstitial space at the top or bottom of the backboard. Conduits shall enter communication closets next to the wall and be flush with the backboard.

G. Were drilling is necessary for vertical conduits, locate holes so as not to affect structural sections such as ribs or beams.

H. All empty conduits located in communication closets or on backboards shall be sealed with a standard non-hardening duct seal compound to prevent the entrance of moisture and gases and to meet fire resistance requirements.

I. Conduit runs shall contain no more than four quarter turns (90 degree bends) between pull boxes/backboards. Minimum radius of communication conduit bends shall be as follows (special long radius):

Sizes of Conduit Trade Size	Radius of Conduit Bends mm, Inches
3/4	150 (6)
1	230 (9)
1-1/4	350 (14)
1-1/2	430 (17)
2	525 (21)
2-1/2	635 (25)
3	775 (31)
3-1/2	900 (36)
4	1125 (45)

J. Furnish and install 19 mm (3/4 inch) thick fire retardant plywood specified in Section 06 10 00, ROUGH CARPENTRY on the wall of communication closets where shown on drawings . Mount the plywood with the bottom edge 300 mm (one foot) above the finished floor.

K. Furnish and pull wire in all empty conduits. (Sleeves through floor are exceptions)

END OF SECTION

DIVISION 27 – ELECTRICAL
SECTION 27 11 00 - COMMUNICATIONS NETWORK AND CABLING SYSTEM

1.01 SUBMITTALS

A. Shop drawings shall be submitted as follows:
   1. Manufacturer's published literature for each separate type of equipment provided. Indicate model number on cutsheet.
   2. One line schematic of complete system showing a floor plan to scale. Show locations and the type of outlets, as well as all rack locations, and cabling type.
   3. Documentation of testing on all wiring and terminations as per ANSI/TIA standards.

1.02 MANUFACTURERS

A. Acceptable manufacturers for each type of equipment specified shall be as noted throughout this specification section.

B. The acceptable manufacturers noted shall be installed by the authorized local factory dealer/representative for that product.

C. The contractor shall hold a current low voltage contractor's license and RCDD certificate. Any other interested parties shall submit a company resume showing years in business, certification stating that he is an authorized representative for the manufacturer of the equipment he is submitting for approval and that he maintains a fully equipped and stocked service shop and shall respond to service calls within 12 normal working hours, list of key personnel, copies of appropriate licenses and list of recently completed jobs. Submittal must be received no later than ten business days prior to bid date in order to be considered.

1.03 GENERAL

A. Workmanship

All work shall be performed in a workmanlike manner. Architect, Engineer, and/or Owner may observe the work procedures and workmanship of the Contractor but such observation will not relieve the contractor from responsibility for performance.

B. Warranty

The warranty starts at the date of Material Completion. The Contractor shall furnish a written warranty that describes the equipment supplied under these specifications will be free from defects of materials and workmanship for a period of fifteen years at no cost to the Owner.

C. Contractor's Qualifications

Contractor shall be required, before awarding of contract, to demonstrate to the complete satisfaction of the Engineer that he has the necessary facilities, ability and financial resources to execute the work in a satisfactory manner and within the time specified; that he has had experience in construction work as same or similar nature; that he has past history and references which will assure the Owner of his qualifications for executing the work.

Contractor shall submit a copy of a valid low-voltage license (Low-Voltage General, Low-Voltage Telecommunications or Low-Voltage Unrestricted as issued by the State Construction Industry Licensing Board of Low-Voltage Contractors).

Contractor shall submit a copy of a BICSI (Building Industry Consulting Service International) certified RCDD (Registered Communications Distributions Designer) certificate.

D. Comprehensive list of references
Attach a detailed list of references along with contact person, dates of work, mailing address, telephone numbers.

E. Contractor must provide proof of installation in a minimum of five sites using a Category 6 structured cabling with 100 or more active (working) nodes installed.

1.04 SCOPE OF WORK

A. Scope of Project Standards and Description

The cabling and wiring placed for voice and data communications on this undertaking shall be "Unshielded Twisted Pair" type and conform to the requirements contained in the latest editions of the National Electric Code (NEC) and the latest editions of the following American National Standards Institute (ANSI) specifications:

1. ANSI/TIA 568-Commercial Building Telecommunications Cabling Standard
2. TIA 569-Commercial Building Standard for Telecommunications Pathways and Spaces
3. ANSI/TIA/EIA 606-Administration Standard for Commercial Telecommunications Infrastructure
4. ANSI/J-STD 607-Commercial Building Grounding (earthing) and Bonding Requirements for Telecommunications
5. Addendums to TIA/EIA 568

B. Specifications for the Fiber Optic Backbone, Jacks Outlets, Horizontal Wiring, Patch Panel, and Racks are provided in this specification section. Electronics are required by Owner.

1.05 GUARANTEES

A. All communication outlets wired and serviceable must be tested and certified in compliance with ANSI/TIA 568-C.2-1 Category 6 specifications. Testing must be "end-to-end". Test results shall be forwarded to Engineer a minimum of one week prior to final inspection.

1.06 TESTING AND CERTIFICATION

A. Testing fiber optic and copper distribution systems are crucial in assuring the overall integrity and satisfactory performance of the network. Test results quantify system quality, identify system faults, and establish the baseline accountability performance of the system. Proper testing also maximizes the longevity of the system, minimizes downtime and maintenance, and facilitates system upgrades or reconfiguration.

B. The Contractor shall provide proof of communications wiring systems certification and testing certification.

C. All data and voice wiring and terminations shall be tested and must pass ANSI/TIA standards for Category 6 Cabling. All faults shall be corrected.

D. All test results must be printed and show the following primary results:

1. Wire map
2. Length
3. Insertion Loss
4. Near-end crosstalk (NEXT)
5. Power sum near end crosstalk (PSNEXT)
6. Equal-level far-end crosstalk (ELFEXT)

7. Power sum equal-level far-end crosstalk (PSELFEXT)
8. Return Loss
9. Propagation delay

1.07 FIBER OPTIC BACKBONE

A. Fiber optic cable shall be provided for backbone inter-building and intra-building wiring. This includes all MDF to IDF and vertical riser applications. All multimode fiber optic cabling used shall be 850nm, laser optimized, OM3, multimode 50 micron core diameter / 125 micron cladding diameter. The multimode fiber optic cable shall meet TIA/EIA 492 AAAB standard. The cable shall meet the requirements of TIA/EIA 568-B.3 standard. As a minimum, backbone and vertical riser cables shall contain 12 fibers. All fibers in each cable must be multimode, with attenuation <3.5 dB loss / km and OFL bandwidth of 500 MHz-km at 850 nm and attenuation <1.25 dB loss/km and OFL bandwidth of 500 MHz-km at 1300 nm. Cables that provide additional fibers to replace defective fibers in the cable are not permitted. Fiber shall meet TIA/EIA 568-B.3-1 for 10 Gb Ethernet applications. Basis of design is Commscope Uniprise 5L/50µm, Laser Core 300. All single mode fiber optic cable used shall be OSP rated, 8.3 micrometers and be loose tube construction. The single mode fiber shall be dispersion unshifted optical fiber that meets ITU-T G.652D requirements. It shall provide optimum performance over entire wavelength range from 1260 to 1625 nanometers and support applications that utilize extended E-band 1360 to 1460 nanometers. It shall also support legacy style mode applications that operate in 1310 and 1550 nanometer ranges. It shall be non armored, gel free, OSP cable. Basis of design is Commscope Uniprise D-012-LN-8W-F12NS.

B. Intra-building fiber optic cabling used to interconnect IC's and MC's shall be a tight buffered, non gel-filled design composed of all dielectric materials and if not installed in conduit shall be plenum rated and listed as OFNP (UL). Fiber optic cable installed underground shall be water blocked with either gel or dry block and rated for outdoor underground duct installation. Any fiber not installed in conduit, shall be installed in plenum rated innderduct.

1.08 UNINTERRUPTIBLE POWER SUPPLY FOR NETWORK ELECTRONICS

A. UPS shall be provided and installed by Contractor. See Sheet T100.

1.09 LOCAL AREA NETWORK (LAN) JACK AND OUTLET SPECIFICATIONS

A. Locations shown on drawings will be equipped with a consistent arrangement of LAN communications outlets.

B. Outlet faceplate for this arrangement shall be configured in the following fashion:

1. The jacks used shall fit properly in the outlet openings of the outlet faceplate. The jacks used shall conform to Category 6 parameters of ANSI/TIA 568-C.2-1

a. In a properly installed Category 6 UTP cabling system, the jacks used shall be capable of supporting LAN data rates of 1000 Mbps.
b. The wiring arrangement of the jack shall conform to the ANSI/TIA 568.
c. The jack shall possess the following characteristics:

1. The eight (8) position / eight (8) conductor jack shall be capable of supporting the previously defined data rates as well as voice (including ISDN).

2. Utilization of 110 type or equivalent insulation displacement hardware for horizontal wire attachment and acceptance of 22 or 23 AWG conductors.
3. The jack wires shall consist of 50 micro-inch lubricated gold plating over 100 micro-inch nickel underplating.

d. Any vacant faceplate position shall be reserved for future growth and should have a dust cover/blank inserted.

C. Acceptable Manufacturer's: Commscope, Molex, Hubbell, AMP, and Ortronics.

D. Each jack shall have faceplate labeled. Also neatly label backside of faceplate with a permanent marker to note jack number.

E. Labeling of multiple drops in a common space shall be sequentially numbered. Numbers shall not be assigned randomly. Coordinate prior to terminating at racks, no exceptions.

1.10 LOCAL AREA NETWORK (LAN) HORIZONTAL WIRING SPECIFICATIONS

A. This section covers the cable from the communications outlet to the patch panel in the IC or wiring closet. These cables shall be Category 6 Unshielded Twisted Pair cable. Each cable shall be placed in a "point-to-point" fashion from the work area outlet to the wiring closet for each communications outlet needed. There shall be no intermediate splices or cross connects in these cables.

B. The characteristics of the horizontal cable are as follows:
1. Category 6 cable consisting of four pair of 23 AWG bare solid copper conductors insulated with a plenum rated material. The insulated conductors are tightly twisted into pairs and jacketed with plenum rated material. No type of shield is required in the sheath.
2. Each sheath shall contain four unshielded copper pairs. Each pair shall have a different twist per foot ratio ranging from 12 to 24 twists per foot. No more than 1/2" inch may be untwisted and the sheath may not be stripped back more than 1/2" inch at the jack during installation.
3. Cable shall have central crossweb to minimize crosstalk between pairs.

C. The cable component shall meet or exceed the following requirements:
1. ASNI/TIA 568-C.2 "Commercial Building Telecommunications Standard, Part 2: Balanced Twisted-Pair Telecommunications Cabling and Components Standard”
2. ASNI/TIA 1152 Requirements for Field Test Instruments and Measurements for Balanced Twisted Pair Cabling ”
3. Certified Category 6 Cable under Third Party Cable Certification Program.
4. ICEA S-102-700
5. ANSI/ICEA S-102-732
6. UL Standard 444
7. National Electric Code - Article 800

D. Specification requirements, the only acceptable Cat. 6 cables approved for use as follows:

1. Mohawk Advancenet
2. Hittachi HCM Premium series
3. Belden Datatwist 4800
4. General Cable Genspeed 6000
5. Berk-Tek Lanmark 1000
6. Commscope Ultramedia 7504

E. Plenum rated cable shall be used. The plenum cable shall be composed of four pair of 23 gauge bare solid copper conductors insulated with a plenum rated insulation that is the same material configuration on all four pairs, 3+1 or 2+2 designs are not allowed. The insulated conductors are tightly twisted into pairs and jacketed with low smoke plenum rated PVC. It shall conform to a NEC Type CMP for plenum and NEC Type CMR for riser applications.

1.11 LOCAL AREA NETWORK (LAN) PATCH PANEL SPECIFICATIONS

A. This section covers the termination hardware located in the MC and IC (wiring closet). The termination hardware shall provide the capability to be able to patch connections between ports on the LAN hardware (electronics) and the horizontal cables to the work area outlets.

B. The Patch panels shall be Category 6 Modular Jack Panels. Provide 24 port or 48 port patch panels as required for number of drops.

C. The termination hardware will be co-located on 19" inch racks with the LAN electronics. The configuration of the patch panels shall be in an agreement that minimizes patch cord lengths. Provisions for cable management (organization of horizontal and vertical cable and patch cords) on the rack should be included.

D. Horizontal cables to the work area outlets will be directly connected to 110 insulation displacement hardware or equivalent associated with each jack on the patch panel. The jacks on the patch panel shall be wired in accordance with ANSI/TIA 568- C.2 standard.

E. Fiber Termination requirements:

Fiber optics connections should be terminated using a rack mountable Interconnect enclosure or equivalent to insure that the connections are protected. The enclosure should be locked and no fiber cable should be visible in the rack.

F. Acceptable Manufacturer's: Commscope, Molex, Hubbell, AMP, and Ortronics..

1.12 LOCAL AREA NETWORK (LAN) RACK SPECIFICATIONS

A. Racks: Communications racks shall be UL listed 7N69. Four-Post Rack shall consist of: (4) vertical rails, (2) base angles, (1) assembly hardware kit, (2) top angles, and (20) #12-24 dog. Two-Post Rack shall consist of: (2) vertical rails, (2) base angles, (1) assembly hardware kit, (2) top angles, and (20) #12-24 dog. All rack design shall be a structural aluminum construction, having 3-inch (76 mm) wide vertical rail channels. Rack to be 19inch “NEXTFRAME” HPW series as manufactured by Hubbell-Premise, 1nc. "C" Cchannel Vertical Cable Organizers and covers as scheduled. "Z" Channel Vertical Cable Organizers and covers.

B. Acceptable equal Manufacturer are Mod-Tap, Ortronics, AT&T, AMP, Leviton, Interlink, Panduit, Siemon and OCC.

1.13 SYSTEM DOCUMENTATION

A. As part of the wiring system installation, the Contractor shall provide detailed documentation of the distribution system to facilitate system administration, system maintenance and future system changes. This requirement includes as-built drawings with all cables and terminations identified, a bill of materials of all installed equipment and wiring, rack and backboard equipment layouts showing placement of support equipment, and model and serial numbers of all installed equipment. A clear and

consistent nomenclature scheme is to be defined and used on the documentation and cable labeling which facilitates locating and identifying each cable.

B. System verification and acceptance documentation signed and dated by the installer (Contractor) and the design professional shall also be provided. This documentation shall include test measurements and system calibrations performed for the entire system. Sample system operations shall also be performed with actual hardware or using contractor provided test equipment and documented to verify that the system is operational and ready for acceptance. This shall also establish the baseline performance of the system.

1.14 TRAINING

A. Training of owner's personnel (a minimum of two) shall be provided. Training will cover the location nomenclature, documentation structure and contents, documentation maintenance procedures, a "walk-through" for location and labeling orientation, system reconfiguration using the MDF, and IDF facilities (Termination hardware, punch blocks, etc.), operation of network equipment installed as part of the contact, test documentation, and trouble shooting of the signal and power cable portion of the installation.

B. Provide a record set plan noting drop locations and jack designations. As-built shall be a full size plan and shall be computer generated in AutoCAD 2007 format. Provide a CD to Owner with (as-build) on disc at project closeout. At each rack provide a copy of (as-built) mounted on wall. Mount plan under plexiglass.

END OF SECTION

DIVISION 28 - ELECTRICAL
SECTION 28 05 00 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section, Common Work Results for Electronic Safety and Security (ESS), applies to all sections of Division 28.

B. Furnish and install fully functional electronic safety and security cabling system(s), equipment and approved accessories in accordance with the specification section(s), drawing(s), and referenced publications. Capacities and ratings of cable and other items and arrangements for the specified items are shown on each system's required Bill of Materials (BOM) and verified on the approved system drawing(s). If there is a conflict between contract's specification(s) and drawings(s), the contract's specification requirements shall prevail.

C. The Contractor shall provide a fully functional and operating ESS, programmed, configured, documented, and tested as required herein and the respective Safety and Security System Specification(s). The Contractor shall provide calculations and analysis to support design and engineering decisions as specified in submittals. The Contractor shall provide and pay all labor, materials, and equipment, sales and gross receipts and other taxes. The Contractor shall secure and pay for plan check fees, permits, other fees, and licenses necessary for the execution of work as applicable for the project. Give required notices; the Contractor will comply with codes, ordinances, regulations, and other legal requirements of public authorities, which bear on the performance of work.

D. The Contractor shall provide an ESS, installed, programmed, configured, documented, and tested. The security system shall include but not limited to: physical access control, intrusion detection, duress alarms, elevator control interface, video assessment and surveillance, video recording and storage, delayed egress, personal protection system, intercommunication system, fire alarm interface, equipment cabinetry, dedicated photo badging system and associated live camera, report printer, photo badge printer, and uninterruptible power supplies (UPS) interface. Operator training shall not be required as part of the Security Contractors scope and shall be provided by the Owner. The Security Contractor shall still be required to provide necessary maintenance and troubleshooting manuals as well as submittals as identified herein. The work shall include the procurement and installation of electrical wire and cables, the installation and testing of all system components. Inspection, testing, demonstration, and acceptance of equipment, software, materials, installation, documentation, and workmanship, shall be as specified herein. The Contractor shall provide all associated installation support, including the provision of primary electrical input power circuits.

E. Repair Service Replacement Parts On-site service during the warranty period shall be provided as specified under "Emergency Service". The Contractor shall guarantee all parts and labor for a term of one (1) year,

unless dictated otherwise in this specification from the acceptance date of the system as described in Part 5 of this Specification. The Contractor shall be responsible for all equipment, software, shipping, transportation charges, and expenses associated with the service of the system for one (1) year. The Contractor shall provide 24-hour telephone support for the software program at no additional charge to the owner. Software support shall include all software updates that occur during the warranty period.

F. Section Includes:
   1. Description of Work for Electronic Security Systems,
   2. Electronic security equipment coordination with relating Divisions,
   3. Submittal Requirements for Electronic Security,
   4. Miscellaneous Supporting equipment and materials for Electronic Security,
   5. Electronic security installation requirements.

1.2 RELATED WORK

A. Section 01 00 00 - GENERAL REQUIREMENTS. For General Requirements.
B. Section 07 84 00 - FIRESTOPPING. Requirements for firestopping application and use.
C. Section 26 05 21 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW). Requirements for power cables.
D. Section 26 05 33 – RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS. Requirements for infrastructure.
E. Section 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for conductors and cables.
F. Section 28 05 26 - GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY. Requirements for grounding of equipment.
G. Section 28 05 28.33 - CONDUITS AND BOXES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for infrastructure.
H. Section 28 08 00 - COMMISIONING OF ELECTRONIC SAFETY AND SECURITY SYSTEMS. Requirements for Commissioning.

1.3 DEFINITIONS

A. AGC: Automatic Gain Control.
B. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.
C. BICSI: Building Industry Consulting Service International.
D. CCD: Charge-coupled device.
E. Central Station: A PC with software designated as the main controlling PC of the security access system. Where this term is presented with initial capital letters, this definition applies.
F. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel section.

G. Controller: An intelligent peripheral control unit that uses a computer for controlling its operation. Where this term is presented with an initial capital letter, this definition applies.
H. CPU: Central processing unit.
I. Credential: Data assigned to an entity and used to identify that entity.
J. DGP: Data Gathering Panel – component of the Physical Access Control System capable to communicate, store and process information received from readers, reader modules, input modules, output modules, and Security Management System.
K. DTS: Digital Termination Service: A microwave-based, line-of-sight communications provided directly to the end user.
L. EMI: Electromagnetic interference.
M. EMT: Electric Metallic Tubing.
N. ESS: Electronic Security System.
O. File Server: A PC in a network that stores the programs and data files shared by users.
P. GFI: Ground fault interrupter.
Q. IDC: Insulation displacement connector.
R. Identifier: A credential card, keypad personal identification number or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.
S. I/O: Input/Output.
T. Intrusion Zone: A space or area for which an intrusion must be detected and uniquely identified, the sensor or group of sensors assigned to perform the detection, and any interface equipment between sensors and communication link to central-station control unit.
U. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).
V. LAN: Local area network.
W. LCD: Liquid-crystal display.
X. LED: Light-emitting diode.
Y. Location: A Location on the network having a PC-to-Controller communications link, with additional Controllers at the Location connected to the PC-to-Controller link with RS-485 communications loop. Where this term is presented with an initial capital letter, this definition applies.
Z. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
AA. M-JPEG: Motion – Joint Photographic Experts Group.
BB. MPEG: Moving picture experts group.
CC. NEC: National Electric Code
DD. NEMA: National Electrical Manufacturers Association
EE. NFPA: National Fire Protection Association

FF. NTSC: National Television System Committee.

GG. NRTL: Nationally Recognized Testing Laboratory.

HH. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

II. PACS: Physical Access Control System; A system comprised of cards, readers, door controllers, servers and software to control the physical ingress and egress of people within a given space

JJ. PC: Personal computer. This acronym applies to the Central Station, workstations, and file servers.

KK. PCI Bus: Peripheral component interconnect; a peripheral bus providing a high-speed data path between the CPU and peripheral devices (such as monitor, disk drive, or network).

LL. PDF: (Portable Document Format.) The file format used by the Acrobat document exchange system software from Adobe.

MM. RCDD: Registered Communications Distribution Designer.

NN. RFI: Radio-frequency interference.

OO. RIGID: Rigid conduit is galvanized steel tubing, with a tubing wall that is thick enough to allow it to be threaded.

PP. RS-232: An TIA/EIA standard for asynchronous serial data communications between terminal devices. This standard defines a 25-pin connector and certain signal characteristics for interfacing computer equipment.

QQ. RS-485: An TIA/EIA standard for multipoint communications.

RR. Solid-Bottom or Non-ventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal side rails, and a bottom without ventilation openings.

SS. SMS: Security Management System – A SMS is software that incorporates multiple security subsystems (e.g., physical access control, intrusion detection, closed circuit television, intercom) into a single platform and graphical user interface.

TT. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.

UU. Trough or Ventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal rails and a bottom having openings sufficient for the passage of air and using 75 percent or less of the plan area of the surface to support cables.

VV. UPS: Uninterruptible Power Supply

XX. UTP: Unshielded Twisted Pair

YY. Workstation: A PC with software that is configured for specific limited security system functions.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least three years.

B. Product Qualification:

1. Manufacturer's product shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years.
2. The Government reserves the right to require the Contractor to submit a list of installations where the products have been in operation before approval.

C. Contractor Qualification:

1. The Contractor or security sub-contractor shall be a licensed security Contractor with a minimum of five (5) years experience installing and servicing systems of similar scope and complexity. The Contractor shall be an authorized regional representative of the Security Management System's (PACS) manufacturer. The Contractor shall provide four (4) current references from clients with systems of similar scope and complexity which became operational in the past three (3) years. At least three (3) of the references shall be utilizing the same system components, in a similar configuration as the proposed system. The references must include a current point of contact, company or agency name, address, telephone number, complete system description, date of completion, and approximate cost of the project. The owner reserves the option to visit the reference sites, with the site owner's permission and representative, to verify the quality of installation and the references' level of satisfaction with the system. The Contractor shall provide copies of system manufacturer certification for all technicians. The Contractor shall only utilize factory-trained technicians to install, program, and service the PACS. The Contractor shall only utilize factory-trained technicians to install, terminate and service controller/field panels and reader modules. The technicians shall have a minimum of five (5) continuous years of technical experience in electronic security systems. The Contractor shall have a local service facility. The facility shall be located within [60] <insert number> miles of the project site. The local facility shall include sufficient spare parts inventory to support the service requirements associated with this contract. The facility shall also include appropriate diagnostic equipment to perform diagnostic procedures. The Resident Engineer reserves the option of surveying the company's facility to verify the service inventory and presence of a local service organization.
2. The Contractor shall provide proof project superintendent with BICSI Certified Commercial Installer Level 1, Level 2, or Technician to provide oversight of the project.
3. Cable installer must have on staff a Registered Communication Distribution Designer (RCDD) certified by Building Industry Consulting Service International. The staff member shall provide consistent oversight of the project cabling throughout design, layout, installation, termination and testing.

D. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

1.5 GENERAL ARANGEMENT OF CONTRACT DOCUMENTS

A. The Contract Documents supplement to this specification indicates approximate locations of equipment. The installation and/or locations of the equipment and devices shall be governed by the intent of the design; specification and Contract Documents, with due regard to actual site conditions, recommendations, ambient factors affecting the equipment and operations in the vicinity. The Contract Documents are diagrammatic and do not reveal all offsets, bends, elbows, components, materials, and other specific elements that may be required for proper installation. If any departure from the contract documents is deemed necessary, or in the event of conflicts, the Contractor shall submit details of such departures or conflicts in writing to the owner or owner's representative for his or her comment and/or approval before initiating work.

B. Anything called for by one of the Contract Documents and not called for by the others shall be of like effect as if required or called by all, except if a provision clearly designed to negate or alter a provision contained in one or more of the other Contract Documents shall have the intended effect. In the event of conflicts among the Contract Documents, the Contract Documents shall take precedence in the following order: the Form of Agreement; the Supplemental General Conditions; the Special Conditions; the Specifications with attachments; and the drawings.

1.6 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. The Government's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site.

C. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.

1. Mark the submittals, "SUBMITTED UNDER SECTION_____".
2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
3. Submit each section separately.

D. The submittals shall include the following:

1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.
2. Submittals are required for all equipment anchors and supports. Submittals shall include weights, dimensions, center of gravity, standard connections, manufacturer's recommendations and behavior problems (e.g., vibration, thermal expansion,) associated with equipment or piping so that the proposed installation can be properly reviewed.
3. Parts list which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.

E. Submittals shall be in full compliance of the Contract Documents. All submittals shall be provided in accordance with this section. Submittals lacking the breath or depth these requirements will be considered incomplete and rejected. Submissions are considered multidisciplinary and shall require coordination with applicable divisions to provide a complete and comprehensive submission package. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Government to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted. Additional general provisions are as follows:

1. The Contractor shall schedule submittals in order to maintain the project schedule. For coordination drawings refer to Specification Section 01 33 10 - Design Submittal Procedures, which outline basic submittal requirements and coordination. Section 01 33 10 shall be used in conjunction with this section.
2. The Contractor shall identify variations from requirements of Contract Documents and state product and system limitations, which may be detrimental to successful performance of the completed work or system.
3. Each package shall be submitted at one (1) time for each review and include components from applicable disciplines (e.g., electrical work, architectural finishes, door hardware, etc.) which are required to produce an accurate and detailed depiction of the project.
4. Manufacturer’s information used for submittal shall have pages with items for approval tagged, items on pages shall be identified, and capacities and performance parameters for review shall be clearly marked through use of an arrow or highlighting. Provide space for Resident Engineer and Contractor review stamps.
5. Technical Data Drawings shall be in the latest version of AutoCAD®, drawn accurately, and in accordance with VA CAD Standards CAD Standard Application Guide, and VA BIM Guide. FREEHAND SKETCHES OR COPIED VERSIONS OF THE CONSTRUCTION DOCUMENTS WILL NOT BE ACCEPTED. The Contractor shall not reproduce Contract Documents or copy standard information as the basis of the Technical Data Drawings. If departures from the technical data drawings are subsequently deemed necessary by the Contractor, details of such departures and the reasons thereof shall be submitted in writing to the Resident Engineer for approval before the initiation of work.
6. Packaging: The Contractor shall organize the submissions according to the following packaging requirements.
    a. Binders: For each manual, provide heavy duty, commercial quality, durable three (3) ring vinyl covered loose leaf binders, sized to receive 8.5 x 11 in paper, and appropriate capacity to accommodate the contents. Provide a clear plastic sleeve on the spine to hold labels describing the contents. Provide pockets in the covers to receive folded sheets.

1) Where two (2) or more binders are necessary to accommodate data; correlate data in each binder into related groupings according to the Project Manual table of contents. Cross-referencing other binders where necessary to provide essential information for communication of proper operation and/or maintenance of the component or system.
2) Identify each binder on the front and spine with printed binder title, Project title or name, and subject matter covered. Indicate the volume number if applicable.

b. Dividers: Provide heavy paper dividers with celluloid tabs for each Section. Mark each tab to indicate contents.

c. Protective Plastic Jackets: Provide protective transparent plastic jackets designed to enclose diagnostic software for computerized electronic equipment.

d. Text Material: Where written material is required as part of the manual use the manufacturer's standard printed material, or if not available, specially prepared data, neatly typewritten on 8.5 inches by 11 inches 20 pound white bond paper.

e. Drawings: Where drawings and/or diagrams are required as part of the manual, provide reinforced punched binder tabs on the drawings and bind them with the text.
1) Where oversized drawings are necessary, fold the drawings to the same size as the text pages and use as a foldout.
2) If drawings are too large to be used practically as a foldout, place the drawing, neatly folded, in the front or rear pocket of the binder. Insert a type written page indicating the drawing title, description of contents and drawing location at the appropriate location of the manual.
3) Drawings shall be sized to ensure details and text is of legible size. Text shall be no less than 1/16” tall.

f. Manual Content: Submit in accordance with Section 01 00 00, GENERAL REQUIREMENTS.
1) Maintenance and Operation Manuals: Submit as required for systems and equipment specified in the technical sections. Furnish four copies, bound in hardback binders, (manufacturer's standard binders) or an approved equivalent. Furnish one complete manual as specified in the technical section but in no case later than prior to performance of systems or equipment test, and furnish the remaining manuals prior to contract completion.
2) Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, equipment, building, name of Contractor, and contract number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the system or equipment.
3) The manuals shall include:
a) Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
b) A control sequence describing start-up, operation, and shutdown.

c) Description of the function of each principal item of equipment.
d) Installation and maintenance instructions.
e) Safety precautions.
f) Diagrams and illustrations.
g) Testing methods.
h) Performance data.
i) Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
j) Appendix; list qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.

g. Binder Organization: Organize each manual into separate sections for each piece of related equipment. At a minimum, each manual shall contain a title page, table of contents, copies of Product Data supplemented by drawings and written text, and copies of each warranty, bond, certifications, and service Contract issued. Refer to Group I through V Technical Data Package Submittal requirements for required section content.
h. Title Page: Provide a title page as the first sheet of each manual to include the following information; project name and address, subject matter covered by the manual, name and address of the Project, date of the submittal, name, address, and telephone number of the Contractor, and cross references to related systems in other operating and/or maintenance manuals.
i. Table of Contents: After the title page, include a type written table of contents for each volume, arranged systematically according to the Project Manual format. Provide a list of each product included, identified by product name or other appropriate identifying symbols and indexed to the content of the volume. Where more than one (1) volume is required to hold data for a particular system, provide a comprehensive table of contents for all volumes in each volume of the set.
j. General Information Section: Provide a general information section immediately following the table of contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the installer and maintenance Contractor. In addition, list a local source for replacement parts and equipment.
k. Drawings: Provide specially prepared drawings where necessary to supplement the manufacturers printed data to illustrate the relationship between components of equipment or systems, or provide control or flow diagrams. Coordinate these drawings with information contained in Project Record Drawings to assure correct illustration of the completed installation.
l. Manufacturer’s Data: Where manufacturer's standard printed data is included in the manuals, include only those sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where more than one (1) item in tabular format is included, identify each item, using appropriate references from the Contract Documents.

Identify data that is applicable to the installation and delete references to information which is not applicable.

m. Where manufacturer's standard printed data is not available and the information is necessary for proper operation and maintenance of equipment or systems, or it is necessary to provide additional information to supplement the data included in the manual, prepare written text to provide the necessary information. Organize the text in a consistent format under a separate heading for different procedures. Where necessary, provide a logical sequence of instruction for each operating or maintenance procedure. Where similar or more than one product is listed on the submittal the Contractor shall differentiate by highlighting the specific product to be utilized.

n. Calculations: Provide a section for circuit and panel calculations.

o. Loading Sheets: Provide a section for DGP Loading Sheets.

p. Certifications: Provide section for Contractor's manufacturer certifications.

7. Contractor Review: Review submittals prior to transmittal. Determine and verify field measurements and field construction criteria. Verify manufacturer's catalog numbers and conformance of submittal with requirements of contract documents. Return non-conforming or incomplete submittals with requirements of the work and contract documents. Apply Contractor's stamp with signature certifying the review and verification of products occurred, and the field dimensions, adjacent construction, and coordination of information is in accordance with the requirements of the contract documents.

8. Resubmission: Revise and resubmit submittals as required within 15 calendar days of return of submittal. Make resubmissions under procedures specified for initial submittals. Identify all changes made since previous submittal.

9. Product Data: Within 15 calendar days after execution of the contract, the Contractor shall submit for approval a complete list of all of major products proposed for use. The data shall include name of manufacturer, trade name, model number, the associated contract document section number, paragraph number, and the referenced standards for each listed product.

F. Group 1 Technical Data Package: Group I Technical Data Package shall be one submittal consisting of the following content and organization. Refer to VA Special Conditions Document for drawing format and content requirements. The data package shall include the following:

1. Section I - Drawings:

a. General – Drawings shall conform to VA CAD Standards Guide. All text associated with security details shall be 1/8" tall and meet VA text standard for AutoCAD™ drawings.

b. Cover Sheet – Cover sheet shall consist of Project Title and Address, Project Number, Area and Vicinity Maps.

c. General Information Sheets – General Information Sheets shall consist of General Notes, Abbreviations, Symbols, Wire and Cable Schedule, Project Phasing, and Sheet Index.

d. Floor Plans – Floor plans shall be produced from the Architectural backgrounds issued in the Construction Documents. The contractor shall receive floor plans from the prime A/E to develop

these drawing sets. Security devices shall be placed on drawings in scale. All text associated with security details shall be 1/8" tall and meet VA text standard for AutoCAD™ drawings. Floor plans shall identify the following:

1) Security devices by symbol,
2) The associated device point number (derived from the loading sheets),
3) Wire & cable types and counts
4) Conduit sizing and routing
5) Conduit riser systems
6) Device and area detail call outs

e. Architectural details – Architectural details shall be produced for each device mounting type (door details for EECS and IDS, Intrusion Detection system (motion sensor, vibration, microwave Motion Sensor and Camera mounting,

f. Riser Diagrams – Contractor shall provide a riser diagram indicating riser architecture and distribution of the SMS throughout the facility (or area in scope).

g. Block Diagrams – Contractor shall provide a block diagram for the entire system architecture and interconnections with SMS subsystems. Block diagram shall identify SMS subsystem (e.g., electronic entry control, intrusion detection, closed circuit television, intercom, and other associated subsystems) integration; and data transmission and media conversion methodologies.

h. Interconnection Diagrams – Contractor shall provide interconnection diagram for each sensor, and device component. Interconnection diagram shall identify termination locations, standard wire detail to include termination schedule. Diagram shall also identify interfaces to other systems such as elevator control, fire alarm systems, and security management systems.

i. Security Details:

1) Panel Assembly Detail – For each panel assembly, a panel assembly details shall be provided identifying individual panel component size and content.
2) Panel Details – Provide security panel details identify general arrangement of the security system components, backboard size, wire through size and location, and power circuit requirements.
3) Device Mounting Details – Provide mounting detailed drawing for each security device (physical access control system, intrusion detection, video surveillance and assessment, and intercom systems) for each type of wall and ceiling configuration in project. Device details shall include device, mounting detail, wiring and conduit routing.
4) Details of connections to power supplies and grounding
5) Details of surge protection device installation
6) Sensor detection patterns – Each system sensor shall have associated detection patterns.
7) Equipment Rack Detail – For each equipment rack, provide a scaled detail of the equipment rack location and rack space utilization. Use of BISCI wire management standards shall be

employed to identify wire management methodology. Transitions between equipment racks shall be shown to include use vertical and horizontal latter rack system.

8) Security Control Room – The contractor shall provide a layout plan for the Security Control Room. The layout plan shall identify all equipment and details associated with the installation.
9) Operator Console – The contractor shall provide a layout plan for the Operator Console. The layout plan shall identify all equipment and details associated with the installation. Equipment room - the contractor shall provide a layout plan for the equipment room. The layout plan shall identify all equipment and details associated with the installation.
10) Equipment Room – Equipment room details shall provide architectural, electrical, mechanical, plumbing, IT/Data and associated equipment and device placements both vertical and horizontally.

j. Electrical Panel Schedule – Electrical Panel Details shall be provided for all SMS systems electrical power circuits. Panel details shall be provided identifying panel type (Standard, Emergency Power, Emergency/Uninterrupted Power Source, and Uninterrupted Power Source Only), panel location, circuit number, and circuit amperage rating.

k. Door Schedule – A door schedule shall be developed for each door equipped with electronic security components. At a minimum, the door schedule shall be coordinated with Division 08 work and include the following information:

1) Item Number
2) Door Number (Derived from A/E Drawings)
3) Floor Plan Sheet Number
4) Standard Detail Number
5) Door Description (Derived from Loading Sheets)
6) Data Gathering Panel Input Number
7) Door Position or Monitoring Device Type & Model Number
8) Lock Type, Model Number & Power Input/Draw (standby/active)
9) Card Reader Type & Model Number
10) Shunting Device Type & Model Number
11) Sounder Type & Model Number
12) Manufacturer
13) Misc. devices as required
    a) Delayed Egress Type & Model Number
    b) Intercom
    c) Camera
    d) Electric Transfer Hinge
    e) Electric Pass-through device

14) Remarks column indicating special notes or door configurations

2. Section II – Data Gathering Panel Documentation Package
   a. Contractor shall provide Data Gathering Panel (DGP) input and output documentation packages for review at the Shop Drawing submittal stage and also with the as-built documentation package. The documentation packages shall be provided in both printed and magnetic form at both review stages.
   b. The Contractor shall provide loading sheet documentation package for the associated DGP, including input and output boards for all field panels associated with the project. Documentation shall be provided in current version Microsoft Excel spreadsheets following the format currently utilized by VA. A separate spreadsheet file shall be generated for each DGP and associated field panels.
   c. The spreadsheet names shall follow a sequence that shall display the spreadsheets in numerical order according to the DGP system number. The spreadsheet shall include the prefix in the file name that uniquely identifies the project site. The spreadsheet shall detail all connected items such as card readers, alarm inputs, and relay output connections. The spreadsheet shall include an individual section (row) for each panel input, output and card reader. The spreadsheet shall automatically calculate the system numbers for card readers, inputs, and outputs based upon data entered in initialization fields.
   d. All entries must be verified against the field devices. Copies of the floor plans shall be forwarded under separate cover.
   e. The DGP spreadsheet shall include an entry section for the following information:
      1) DGP number
      2) First Reader Number
      3) First Monitor Point Number
      4) First Relay Number
      5) DGP, input or output Location
      6) DGP Chain Number
      7) DGP Cabinet Tamper Input Number
      8) DGP Power Fail Input Number
      9) Number of Monitor Points Reserved For Expansion Boards
      10) Number of Control Points (Relays) Reserved For Expansion Boards
   f. The DGP, input module and output module spreadsheets shall automatically calculate the following information based upon the associated entries in the above fields:
      1) System Numbers for Card Readers
      2) System Numbers for Monitor Point Inputs
      3) System Numbers for Control Points (Relays)
      4) Next DGP or input module First Monitor Point Number

5) Next DGP or output module First Control Point Number

g. The DGP spreadsheet shall provide the following information for each card reader:
   1) DGP Reader Number
   2) System Reader Number
   3) Cable ID Number
   4) Description Field (Room Number)
   5) Description Field (Device Type i.e.: In Reader, Out Reader, etc.)
   6) Description Field
   7) DGP Input Location
   8) Date Test
   9) Date Passed
   10) Cable Type
   11) Camera Numbers (of cameras viewing the reader location)

h. The DGP and input module spreadsheet shall provide the following information for each monitor point (alarm input).
   1) DGP Monitor Point Input Number
   2) System Monitor Point Number
   3) Cable ID Number
   4) Description Field (Room Number)
   5) Description Field (Device Type i.e.: Door Contact, Motion Detector, etc.)
   7) DGP or input module Input Location
   8) Date Test
   9) Date Passed
   10) Cable Type
   11) Camera Numbers (of associated alarm event preset call-ups)

i. The DGP and output module spreadsheet shall provide the following information for each control point (output relay).
   1) DGP Control Point (Relay) Number
   2) System (Control Point) Number
   3) Cable ID Number
   4) Description Field (Room Number)
   5) Description Field (Device: Lock Control, Local Sounder, etc.)
   6) Description Field
   7) DGP or OUTPUT MODULE Output Location
   8) Date Test
   9) Date Passed Cable Type
   10) Camera Number (of associated alarm event preset call-ups)

j. The DGP, input module and output module spreadsheet shall include the following information or directions in the header and footer:
   1) Header
      a) DGP Input and Output Worksheet
      b) Enter Beginning Reader, Input, and Output Starting Numbers and Sheet Will Automatically Calculate the Remaining System Numbers.
   2) Footer
      a) File Name
      b) Date Printed
      c) Page Number

G. Group II Technical Data Package
   1. The Contractor shall prepare a report of "Current Site Conditions" and submit a report to the Resident Engineer documenting changes to the site, particularly those conditions that affect performance of the system to be installed. The Contractor shall provide specification sheets, or written functional requirements to support the findings, and a cost estimate to correct those site changes or conditions which affect the installation of the system or its performance. The Contractor shall not correct any deficiency without written permission from the COTR.
   2. System Configuration and Functionality: The contractor shall provide the results of the meeting with VA to develop system requirements and functionality including but not limited to:
      a. Baseline configuration
      b. Access levels
      c. Schedules (intrusion detection, physical access control, holidays, etc.)
      d. Badge database
      e. System monitoring and reporting (unit level and central control)
      f. Naming conventions and descriptors

H. Group III Technical Data Package
   1. Development of Test Procedures: The Contractor will prepare performance test procedures for the system testing. The test procedures shall follow the format of the VA Testing procedures and be customized to the contract requirements. The Contractor will deliver the test procedures to the Resident Engineer for approval at least 60 calendar days prior to the requested test date.

I. Group IV Technical Data Package
   1. Performance Verification Test
      a. Based on the successful completion of the pre-delivery test, the Contractor shall finalize the test procedures and report forms for the performance verification test (PVT) and the endurance test. The PVT shall follow the format, layout and content of the pre-delivery test. The Contractor shall

deliver the PVT and endurance test procedures to the Resident Engineer for approval. The Contractor may schedule the PVT after receiving written approval of the test procedures. The Contractor shall deliver the final PVT and endurance test reports within 14 calendar days from completion of the tests. Refer to Part 3 of this section for System Testing and Acceptance requirements.

J. Group V Technical Data Package: Final copies of the manuals shall be delivered to the Resident Engineer as part of the acceptance test. The draft copy used during site testing shall be updated with any changes required prior to final delivery of the manuals. Each manual's contents shall be identified on the cover. The manual shall include names, addresses, and telephone numbers of each sub-contractor installing equipment or systems, as well as the nearest service representatives for each item of equipment for each system. The manuals shall include a table of contents and tab sheets. Tab sheets shall be placed at the beginning of each chapter or section and at the beginning of each appendix. The final copies delivered after completion of the endurance test shall include all modifications made during installation, checkout, and acceptance. Six (6) hard-copies and one (1) soft copy on CD of each item listed below shall be delivered as a part of final systems acceptance.

1. Functional Design Manual: The functional design manual shall identify the operational requirements for the entire system and explain the theory of operation, design philosophy, and specific functions. A description of hardware and software functions, interfaces, and requirements shall be included for all system operating modes. Manufacturer developed literature may be used; however, shall be produced to match the project requirements.
2. Equipment Manual: A manual describing all equipment furnished including:
    a. General description and specifications; installation and checkout procedures; equipment electrical schematics and layout drawings; system schematics and layout drawings; alignment and calibration procedures; manufacturer's repair list indicating sources of supply; and interface definition.
3. Software Manual: The software manual shall describe the functions of all software and include all other information necessary to enable proper loading, testing, and operation. The manual shall include:
    a. Definition of terms and functions; use of system and applications software; procedures for system initialization, start-up, and shutdown; alarm reports; reports generation, database format and data entry requirements; directory of all disk files; and description of all communications protocols including data formats, command characters, and a sample of each type of data transfer.
4. Operator's Manual: The operator's manual shall fully explain all procedures and instructions for the operation of the system, including:
    a. Computers and peripherals; system start-up and shutdown procedures; use of system, command, and applications software; recovery and restart procedures; graphic alarm presentation; use of

report generator and generation of reports; data entry; operator commands' alarm messages, and printing formats; and system access requirements.

5. Maintenance Manual: The maintenance manual shall include descriptions of maintenance for all equipment including inspection, recommend schedules, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.
6. Spare Parts & Components Data: At the conclusion of the Contractor's work, the Contractor shall submit to the Resident Engineer a complete list of the manufacturer's recommended spare parts and components required to satisfactorily maintain and service the systems, as well as unit pricing for those parts and components.
7. Operation, Maintenance & Service Manuals: The Contractor shall provide two (2) complete sets of operating and maintenance manuals in the form of an instructional manual for use by the VA Security Guard Force personnel. The manuals shall be organized into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder. If multiple volumes are required, each volume shall be fully indexed and coordinated.
8. Equipment and Systems Maintenance Manual: The Contractor shall provide the following descriptive information for each piece of equipment, operating system, and electronic system:
    a. Equipment and/or system function.
    b. Operating characteristics.
    c. Limiting conditions.
    d. Performance curves.
    e. Engineering data and test.
    f. Complete nomenclature and number of replacement parts.
    g. Provide operating and maintenance instructions including assembly drawings and diagrams required for maintenance and a list of items recommended to stock as spare parts.
    h. Provide information detailing essential maintenance procedures including the following: routine operations, trouble shooting guide, disassembly, repair and re-assembly, alignment, adjusting, and checking.
    i. Provide information on equipment and system operating procedures, including the following; start-up procedures, routine and normal operating instructions, regulation and control procedures, instructions on stopping, shut-down and emergency instructions, required sequences for electric and electronic systems, and special operating instructions.
    j. Manufacturer equipment and systems maintenance manuals are permissible.
9. Project Redlines: During construction, the Contractor shall maintain an up-to-date set of construction redlines detailing current location and configuration of the project components. The redline documents shall be marked with the words 'Master Redlines' on the cover sheet and be maintained by the Contractor in the project office. The Contractor will provide access to redline documents anytime during the project for review and inspection by the Resident Engineer or authorized Office of

Protection Services representative. Master redlines shall be neatly maintained throughout the project and secured under lock and key in the contractor's onsite project office. Any project component or assembly that is not installed in strict accordance with the drawings shall be so noted on the drawings. Prior to producing Record Construction Documents, the contractor will submit the Master Redline document to the Resident Engineer for review and approval of all changes or modifications to the documents. Each sheet shall have Resident Engineer initials indicating authorization to produce "As Built" documents. Field drawings shall be used for data gathering & field changes. These changes shall be made to the master redline documents daily. Field drawings shall not be considered "master redlines".

10. Record Specifications: The Contractor shall maintain one (1) copy of the Project Specifications, including addenda and modifications issued, for Project Record Documents. The Contractor shall mark the Specifications to indicate the actual installation where the installation varies substantially from that indicated in the Contract Specifications and modifications issued. (Note related Project Record Drawing information where applicable). The Contractor shall pay particular attention to substitutions, selection of product options, and information on concealed installations that would be difficult to identify or measure and record later. Upon completion of the mark ups, the Contractor shall submit record Specifications to the COTR. As with master relines, Contractor shall maintain record specifications for Resident Engineer review and inspection at anytime.
11. Record Product Data: The Contractor shall maintain one (1) copy of each Product Data submittal for Project Record Document purposes. The Data shall be marked to indicate the actual product installed where the installation varies substantially from that indicated in the Product Data submitted. Significant changes in the product delivered to the site and changes in manufacturer's instructions and recommendations for installation shall be included. Particular attention will be given to information on concealed products and installations that cannot be readily identified or recorded later. Note related Change Orders and mark up of Record Construction Documents, where applicable. Upon completion of mark up, submit a complete set of Record Product Data to the COTR.
12. Miscellaneous Records: The Contractor shall maintain one (1) copy of miscellaneous records for Project Record Document purposes. Refer to other Specifications for miscellaneous record-keeping requirements and submittals concerning various construction activities. Before substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Categories of requirements resulting in miscellaneous records include a minimum of the following:
    a. Certificates received instead of labels on bulk products.
    b. Testing and qualification of tradesmen. ("Contractor's Qualifications")
    c. Documented qualification of installation firms.
    d. Load and performance testing.
    e. Inspections and certifications.

f. Final inspection and correction procedures.

g. Project schedule

13. Record Construction Documents (Record As-Built)

a. Upon project completion, the contractor shall submit the project master redlines to the Resident Engineer prior to development of Record construction documents. The Resident Engineer shall be given a minimum of a thirty (30) day review period to determine the adequacy of the master redlines. If the master redlines are found suitable by the Resident Engineer, the Resident Engineer will initial and date each sheet and turn redlines over to the contractor for as built development.

b. The Contractor shall provide the Resident Engineer a complete set of "as-built" drawings and original master redlined marked "as-built" blue-line in the latest version of AutoCAD drawings unlocked on CD or DVD. The as-built drawing shall include security device number, security closet connection location, data gathering panel number, and input or output number as applicable. All corrective notations made by the Contractor shall be legible when submitted to the COTR. If, in the opinion of the COTR, any redlined notation is not legible, it shall be returned to the Contractor for re-submission at no extra cost to the Owner. The Contractor shall organize the Record Drawing sheets into manageable sets bound with durable paper cover sheets with suitable titles, dates, and other identifications printed on the cover. The submitted as built shall be in editable formats and the ownership of the drawings shall be fully relinquished to the owner.

c. Where feasible, the individual or entity that obtained record data, whether the individual or entity is the installer, sub-contractor, or similar entity, is required to prepare the mark up on Record Drawings. Accurately record the information in a comprehensive drawing technique. Record the data when possible after it has been obtained. For concealed installations, record and check the mark up before concealment. At the time of substantial completion, submit the Record Construction Documents to the COTR. The Contractor shall organize into bound and labeled sets for the COTR's continued usage. Provide device, conduit, and cable lengths on the conduit drawings. Exact in-field conduit placement/routings shall be shown. All conduits shall be illustrated in their entire length from termination in security closets; no arrowed conduit runs shall be shown. Pull box and junction box sizes are to be shown if larger than 100mm (4 inch).

K. Approvals will be based on complete submission of manuals together with shop drawings.

L. After approval and prior to installation, furnish the Resident Engineer with one sample of each of the following:

1. A 300 mm (12 inch) length of each type and size of wire and cable along with the tag from the coils of reels from which the samples were taken.
2. Each type of conduit and pathway coupling, bushing and termination fitting.
3. Conduit hangers, clamps and supports.
4. Duct sealing compound.

M. Completed System Readiness Checklists provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 28 08 00 COMMISSIONING OF ELECTRONIC SAFETY AND SECURITY SYSTEMS.

N. In addition to the requirement of SUBMITTALS, the VA reserves the right to request the manufacturer to arrange for a VA representative to see typical active systems in operation, when there has been no prior experience with the manufacturer or the type of equipment being submitted.

1.7 APPLICABLE PUBLICATIONS

A. The publications listed below (including amendments, addenda, revisions, supplement, and errata) form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American National Standards Institute (ANSI)/ International Code Council (ICC):
A117.1.....Standard on Accessible and Usable Buildings and Facilities

C. American National Standards Institute (ANSI)/ Security Industry Association (SIA):
AC-03.....Access Control: Access Control Guideline Dye Sublimation Printing Practices for PVC Access Control Cards
CP-01-00 .....Control Panel Standard-Features for False Alarm Reduction
PIR-01-00.....Passive Infrared Motion Detector Standard - Features for Enhancing False Alarm Immunity
TVAC-01.....CCTV to Access Control Standard - Message Set for System Integration

D. American National Standards Institute (ANSI)/Electronic Industries Alliance (EIA):
330-09 .....Electrical Performance Standards for CCTV Cameras
375A-76.....Electrical Performance Standards for CCTV Monitors

E. American National Standards Institute (ANSI):
ANSI S3.2-99.....Method for measuring the Intelligibility of Speech over Communications Systems

F. American Society for Testing and Materials (ASTM)
B1-07.....Standard Specification for Hard-Drawn Copper Wire
B3-07.....Standard Specification for Soft or Annealed Copper Wire
B8-04.....Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
C1238-97 (R03).....Standard Guide for Installation of Walk-Through Metal Detectors
D2301-04.....Standard Specification for Vinyl Chloride Plastic Pressure Sensitive Electrical Insulating Tape

G. Architectural Barriers Act (ABA), 1968

H. Department of Justice: American Disability Act (ADA)
28 CFR Part 36-2010 ADA Standards for Accessible Design

I. Department of Veterans Affairs:
VHA National CAD Standard Application Guide, 2006
VA BIM Guide, V1.0 10

J. Federal Communications Commission (FCC):
(47 CFR 15) Part 15 Limitations on the Use of Wireless Equipment/Systems

K. Federal Information Processing Standards (FIPS):
FIPS-201-1 .....Personal Identity Verification (PIV) of Federal Employees and Contractors

L. Federal Specifications (Fed. Spec.):
A-A-59544-08 .....Cable and Wire, Electrical (Power, Fixed Installation)

M. Government Accountability Office (GAO):
GAO-03-8-02 .....Security Responsibilities for Federally Owned and Leased Facilities

N. Homeland Security Presidential Directive (HSPD):
HSPD-12 .....Policy for a Common Identification Standard for Federal Employees and Contractors

O. Institute of Electrical and Electronics Engineers (IEEE):
81-1983 .....IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
802.3af-08 .....Power over Ethernet Standard
802.3at-09 .....Power over Ethernet (PoE) Plus Standard
C2-07.....National Electrical Safety Code
C62.41-02.....IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits
C95.1-05.....Standards for Safety Levels with Respect to Human Exposure in Radio Frequency Electromagnetic Fields

P. International Organization for Standardization (ISO):
7810.....Identification cards – Physical characteristics
7811.....Physical Characteristics for Magnetic Stripe Cards
7816-1 .....Identification cards - Integrated circuit(s) cards with contacts - Part 1: Physical characteristics
7816-2 .....Identification cards - Integrated circuit cards - Part 2: Cards with contacts -Dimensions and location of the contacts
7816-3 .....Identification cards - Integrated circuit cards - Part 3: Cards with contacts - Electrical interface and transmission protocols

7816-4 .....Identification cards - Integrated circuit cards - Part 11: Personal verification through biometric methods

7816-10 .....Identification cards - Integrated circuit cards - Part 4: Organization, security and commands for interchange

14443.....Identification cards - Contactless integrated circuit cards; Contactless Proximity Cards Operating at 13.56 MHz in up to 5 inches distance

15693.....Identification cards -- Contactless integrated circuit cards - Vicinity cards; Contactless Vicinity Cards Operating at 13.56 MHz in up to 50 inches distance

19794.....Information technology - Biometric data interchange formats

Q. National Electrical Contractors Association

303-2005 .....Installing Closed Circuit Television (CCTV) Systems

R. National Electrical Manufactures Association (NEMA):

250-08 .....Enclosures for Electrical Equipment (1000 Volts Maximum)

TC-3-04.....PVC Fittings for Use with Rigid PVC Conduit and Tubing

FB1-07.....Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable

S. National Fire Protection Association (NFPA):

70-11 ..... National Electrical Code (NEC)

731-08 .....Standards for the Installation of Electric Premises Security Systems

99-2005 .....Health Care Facilities

T. National Institute of Justice (NIJ)

0601.02-03 .....Standards for Walk-Through Metal Detectors for use in Weapons Detection

0602.02-03 .....Hand-Held Metal Detectors for Use in Concealed Weapon and Contraband Detection

U. National Institute of Standards and Technology (NIST):

IR 6887 V2.1.....Government Smart Card Interoperability Specification (GSC-IS)

Special Pub 800-37.....Guide for Applying the Risk Management Framework to Federal Information Systems

Special Pub 800-63.....Electronic Authentication Guideline

Special Pub 800-73-3 .....Interfaces for Personal Identity Verification (4 Parts)

.....Pt. 1- End Point PIV Card Application Namespace, Data Model & Representation

.....Pt. 2- PIV Card Application Card Command Interface

.....Pt. 3- PIV Client Application Programming Interface

.....Pt. 4- The PIV Transitional Interfaces & Data Model Specification

Special Pub 800-76-1 .....Biometric Data Specification for Personal Identity Verification
Special Pub 800-78-2 .....Cryptographic Algorithms and Key Sizes for Personal Identity Verification
Special Pub 800-79-1 .....Guidelines for the Accreditation of Personal Identity Verification Card Issuers
Special Pub 800-85B-1.....DRAFTPIV Data Model Test Guidelines
Special Pub 800-85A-2 .....PIV Card Application and Middleware Interface Test Guidelines (SP 800-73-3 compliance)
Special Pub 800-96.....PIV Card Reader Interoperability Guidelines
Special Pub 800-104A.....Scheme for PIV Visual Card Topography

V. Occupational and Safety Health Administration (OSHA):
29 CFR 1910.97 .....Nonionizing radiation

W. Section 508 of the Rehabilitation Act of 1973

X. Security Industry Association (SIA):
AG-01 .....Security CAD Symbols Standards

Y. Underwriters Laboratories, Inc. (UL):
1-05 .....Flexible Metal Conduit
5-04 .....Surface Metal Raceway and Fittings
6-07 .....Rigid Metal Conduit
44-05 .....Thermoset-Insulated Wires and Cables
50-07 .....Enclosures for Electrical Equipment
83-08 .....Thermoplastic-Insulated Wires and Cables
294-99 .....The Standard of Safety for Access Control System Units
305-08 .....Standard for Panic Hardware
360-09 .....Liquid-Tight Flexible Steel Conduit
444-08 .....Safety Communications Cables
464-09 .....Audible Signal Appliances
467-07 .....Electrical Grounding and Bonding Equipment
486A-03.....Wire Connectors and Soldering Lugs for Use with Copper Conductors
486C-04.....Splicing Wire Connectors
486D-05.....Insulated Wire Connector Systems for Underground Use or in Damp or Wet Locations
486E-00.....Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
493-07 .....Thermoplastic-Insulated Underground Feeder and Branch Circuit Cable
514A-04.....Metallic Outlet Boxes
514B-04.....Fittings for Cable and Conduit

51-05 .....Schedule 40 and 80 Rigid PVC Conduit
609-96 .....Local Burglar Alarm Units and Systems
634-07 .....Standards for Connectors with Burglar-Alarm Systems
636-01 .....Standard for Holdup Alarm Units and Systems
639-97 .....Standard for Intrusion-Detection Units
651-05 .....Schedule 40 and 80 Rigid PVC Conduit
651A-07.....Type EB and A Rigid PVC Conduit and HDPE Conduit
752-05 .....Standard for Bullet-Resisting Equipment
797-07 .....Electrical Metallic Tubing
827-08 .....Central Station Alarm Services
1037-09 .....Standard for Anti-theft Alarms and Devices
1635-10 .....Digital Alarm Communicator System Units
1076-95 .....Standards for Proprietary Burglar Alarm Units and Systems
1242-06 .....Intermediate Metal Conduit
1479-03 .....Fire Tests of Through-Penetration Fire Stops
1981-03 .....Central Station Automation System
2058-05 .....High Security Electronic Locks
60950.....Safety of Information Technology Equipment
60950-1 .....Information Technology Equipment - Safety - Part 1: General Requirements

Z. Uniform Federal Accessibility Standards (UFAS) 1984

AA. United States Department of Commerce:

Special Pub 500-101 .....Care and Handling of Computer Magnetic Storage Media

1.8 COORDINATION

A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:
   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
   3. To allow right of way for piping and conduit installed at required slope.
   4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed.

1.9 MAINTENANCE & SERVICE

A. General Requirements

1. The Contractor shall provide all services required and equipment necessary to maintain the entire integrated electronic security system in an operational state as specified for a period of one (1) year after formal written acceptance of the system. The Contractor shall provide all necessary material required for performing scheduled adjustments or other non-scheduled work. Impacts on facility operations shall be minimized when performing scheduled adjustments or other non-scheduled work. See also General Project Requirements.

B. Description of Work
   1. The adjustment and repair of the security system includes all software updates, panel firmware, and the following new items computers equipment, communications transmission equipment and data transmission media (DTM), local processors, security system sensors, physical access control equipment, facility interface, signal transmission equipment, and video equipment.

C. Personnel
   1. Service personnel shall be certified in the maintenance and repair of the selected type of equipment and qualified to accomplish all work promptly and satisfactorily. The Resident Engineer shall be advised in writing of the name of the designated service representative, and of any change in personnel. The Resident Engineer shall be provided copies of system manufacturer certification for the designated service representative.

D. Schedule of Work
   1. The work shall be performed during regular working hours, Monday through Friday, excluding federal holidays.

E. System Inspections
   1. These inspections shall include:
      a. The Contractor shall perform two (2) minor inspections at six (6) month intervals or more if required by the manufacturer, and two (2) major inspections offset equally between the minor inspections to effect quarterly inspection of alternating magnitude.
         1) Minor Inspections shall include visual checks and operational tests of all console equipment, peripheral equipment, local processors, sensors, electrical and mechanical controls, and adjustments on printers.
         2) Major Inspections shall include all work described for Minor Inspections and the following: clean all system equipment and local processors including interior and exterior surfaces; perform diagnostics on all equipment; operational tests of the CPU, switcher, peripheral equipment, recording devices, monitors, picture quality from each camera; check, walk test, and calibrate each sensor; run all system software diagnostics and correct all problems; and resolve any previous outstanding problems.

F. Emergency Service
   1. The owner shall initiate service calls whenever the system is not functioning properly. The Contractor shall provide the Owner with an emergency service center telephone number. The emergency service

center shall be staffed 24 hours a day 365 days a year. The Owner shall have sole authority for determining catastrophic and non-catastrophic system failures within parameters stated in General Project Requirements.

a. For catastrophic system failures, the Contractor shall provide same day four (4) hour service response with a defect correction time not to exceed eight (8) hours from [notification] [arrival on site]. Catastrophic system failures are defined as any system failure that the Owner determines will place the facility(s) at increased risk.
b. For non-catastrophic failures, the Contractor within eight (8) hours with a defect correction time not to exceed 24 hours from notification.

G. Operation
1. Performance of scheduled adjustments and repair shall verify operation of the system as demonstrated by the applicable portions of the performance verification test.

H. Records & Logs
1. The Contractor shall maintain records and logs of each task and organize cumulative records for each component and for the complete system chronologically. A continuous log shall be submitted for all devices. The log shall contain all initial settings, calibration, repair, and programming data. Complete logs shall be maintained and available for inspection on site, demonstrating planned and systematic adjustments and repairs have been accomplished for the system.

I. Work Request
1. The Contractor shall separately record each service call request, as received. The record shall include the serial number identifying the component involved, its location, date and time the call was received, specific nature of trouble, names of service personnel assigned to the task, instructions describing the action taken, the amount and nature of the materials used, and the date and time of commencement and completion. The Contractor shall deliver a record of the work performed within five (5) working days after the work was completed.

J. System Modifications
1. The Contractor shall make any recommendations for system modification in writing to the Resident Engineer. No system modifications, including operating parameters and control settings, shall be made without prior written approval from the Resident Engineer. Any modifications made to the system shall be incorporated into the operation and maintenance manuals and other documentation affected.

K. Software
1. The Contractor shall provide all software updates when approved by the Owner from the manufacturer during the installation and 12-month warranty period and verify operation of the system. These updates shall be accomplished in a timely manner, fully coordinated with the system operators, and incorporated into the operations and maintenance manuals and software documentation. There shall be at least one (1) scheduled update near the end of the first year’s warranty period, at which time the Contractor shall install and validate the latest released version of the Manufacturer’s software. All

software changes shall be recorded in a log maintained in the unit control room. An electronic copy of the software update shall be maintained within the log. At a minimum, the contractor shall provide a description of the modification, when the modification occurred, and name and contact information of the individual performing the modification. The log shall be maintained in a white 3 ring binder and the cover marked “SOFTWARE CHANGE LOG”.

1.10 MINIMUM REQUIREMENTS

A. References to industry and trade association standards and codes are minimum installation requirement standards.

B. Drawings and other specification sections shall govern in those instances where requirements are greater than those specified in the above standards.

1.11 DELIVERY, STORAGE, & HANDLING

A. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain:

1. During installation, enclosures, equipment, controls, controllers, circuit protective devices, and other like items, shall be protected against entry of foreign matter; and be vacuum cleaned both inside and outside before testing and operating and repainting if required.
2. Damaged equipment shall be, as determined by the Resident Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.
3. Painted surfaces shall be protected with factory installed removable heavy craft paper, sheet vinyl or equal.
4. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

B. Central Station, Workstations, and Controllers:

1. Store in temperature and humidity controlled environment in original manufacturer's sealed containers. Maintain ambient temperature between 10 to 30 deg C (50 to 85 deg F), and not more than 80 percent relative humidity, non-condensing.
2. Open each container; verify contents against packing list, and file copy of packing list, complete with container identification for inclusion in operation and maintenance data.
3. Mark packing list with designations which have been assigned to materials and equipment for recording in the system labeling schedules generated by cable and asset management system.
4. Save original manufacturer's containers and packing materials and deliver as directed under provisions covering extra materials.

1.12 PROJECT CONDITIONS

A. Environmental Conditions: System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components, except central-station control unit, installed in temperature-controlled interior environments shall be rated for continuous operation in ambient

conditions of 2 to 50 deg C (36 to 122 deg F) dry bulb and 20 to 90 percent relative humidity, non-condensing. NEMA 250, Type 1 enclosure.

2. Interior, Uncontrolled Environment: System components installed in non-temperature-controlled interior environments shall be rated for continuous operation in ambient conditions of -18 to 50 deg C (0 to 122 deg F) dry bulb and 20 to 90 percent relative humidity, non-condensing. NEMA 250, Type 4X enclosures.
3. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient conditions of -34 to 50 deg C (-30 to 122 deg F) dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation where exposed to rain as specified in NEMA 250, winds up to 137 km/h (85 mph) and snow cover up to 610 mm (24 in) thick. NEMA 250, Type 4X enclosures.
4. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
5. Corrosive Environment: For system components subjected to corrosive fumes, vapors, and wind-driven salt spray in coastal zones, provide NEMA 250, Type 4X enclosures.

B. Security Environment: Use vandal resistant enclosures in high-risk areas where equipment may be subject to damage.

C. Console: All console equipment shall, unless noted otherwise, be rated for continuous operation under ambient environmental conditions of 15.6 to 29.4 deg C (60 to 85 deg F) and a relative humidity of 20 to 80 percent.

1.13 EQUIPMENT AND MATERIALS

A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts shall be available.

B. When more than one unit of the same class of equipment is required, such units shall be the product of a single manufacturer.

C. Equipment Assemblies and Components:
1. Components of an assembled unit need not be products of the same manufacturer.
2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
3. Components shall be compatible with each other and with the total assembly for the intended service.
4. Constituent parts which are similar shall be the product of a single manufacturer.

D. Factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.

E. When Factory Testing Is Specified:

1. The Government shall have the option of witnessing factory tests. The contractor shall notify the VA through the Resident Engineer a minimum of 15 working days prior to the manufacturers making the factory tests.
2. Four copies of certified test reports containing all test data shall be furnished to the Resident Engineer prior to final inspection and not more than 90 days after completion of the tests.
3. When equipment fails to meet factory test and re-inspection is required, the contractor shall be liable for all additional expenses, including expenses of the Government.

1.14 TRANSIENT VOLTAGE SUPPRESSION, POWER SURGE SUPPLESION, & GROUNDING

A. Grounding and Surge Suppression

1. The Security Contractor shall provide grounding and surge suppression to stabilize the voltage under normal operating conditions. To ensure the operation of over current devices, such as fuses, circuit breakers, and relays, under ground-fault conditions.
2. Security Contractor shall engineer and provide proper grounding and surge suppression as required by local jurisdiction and prevailing codes and standards referenced in this document.
3. Principal grounding components and features. Include main grounding buses and grounding and bonding connections to service equipment.
4. Details of interconnection with other grounding systems. The lightning protection system shall be provided by the Security Contractor.
5. Locations and sizes of grounding conductors and grounding buses in electrical, data, and communication equipment rooms and closets.
6. AC power receptacles are not to be used as a ground reference point.
7. Any cable that is shielded shall require a ground in accordance with the best practices of the trade and manufactures installation instructions.
8. Protection should be provided at both ends of cabling.

1.15 COMPONENT ENCLOSURES

A. Construction of Enclosures

1. Consoles, power supply enclosures, detector control and terminal cabinets, control units, wiring gutters, and other component housings, collectively referred to as enclosures, shall be so formed and assembled as to be sturdy and rigid.
2. Thickness of metal in-cast and sheet metal enclosures of all types shall not be less than those in Tables I and II, UL 611. Sheet steel used in fabrication of enclosures shall be not less than 14 gauge. Consoles shall be 16-gauge.
3. Doors and covers shall be flanged. Enclosures shall not have pre-punched knockouts. Where doors are mounted on hinges with exposed pins, the hinges shall be of the tight pin type or the ends of hinge pins shall be tack welded to prevent removal. Doors having a latch edge length of less than 609.6 mm (24 in) shall be provided with a single construction core. Where the latch edge of a hinged door is

more than 609.6 mm (24 in) or more in length, the door shall be provided with a three-point latching device with construction core; or alternatively with two, one located near each end.

4. Any ventilator openings in enclosures and cabinets shall conform to the requirements of UL 611. Unless otherwise indicated, sheet metal enclosures shall be designed for wall mounting with tip holes slotted. Mounting holes shall be in positions that remain accessible when all major operating components are in place and the door is open, but shall be in accessible when the door is closed.
5. Covers of pull and junction boxes provided to facilitate initial installation of the system shall be held in place by tamper proof Torx Center post security screws. Stenciled or painted labels shall be affixed to such boxes indicating they contain no connections. These labels shall not indicate the box is part of the Electronic Security System (ESS).

1.16 SUBSTITUTE MATERIALS & EQUIPMENT

A. Where variations from the contract requirements are requested in accordance with the GENERAL CONDITIONS and Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, the connecting work and related components shall include, but not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.

B. In addition to this Section the Security Contractor shall also reference Section II, Products and associated divisions. The Resident Engineer shall have final authority on the authorization or refusal of substitutions. If there are no proposed substitutions, a statement in writing from the Contractor shall be submitted to the Resident Engineer stating same. In the preparation of a list of substitutions, the following information shall be included, as a minimum:

1. Identity of the material or devices specified for which there is a proposed substitution.
2. Description of the segment of the specification where the material or devices are referenced.
3. Identity of the proposed substitute by manufacturer, brand name, catalog or model number and the manufacturer’s product name.
4. A technical statement of all operational characteristic expressing equivalence to items to be substituted and comparison, feature-by-feature, between specification requirements and the material or devices called for in the specification; and Price differential.

C. Materials Not Listed: Furnish all necessary hardware, software, programming materials, and supporting equipment required to place the specified major subsystems in full operation. Note that some supporting equipment, materials, and hardware may not be described herein. Depending on the manufacturers selected by the COTR, some equipment, materials and hardware may not be contained in either the Contract Documents or these written specifications, but are required by the manufacturer for complete operation according to the intent of the design and these specifications. In such cases, the Resident Engineer shall be given the opportunity to approve the additional equipment, hardware and materials that shall be fully identified in the bid and in the equipment list submittal. The Resident Engineer shall be consulted in the event there is any question about which supporting equipment, materials, or hardware is intended to be included.

D. Response to Specification: The Contractor shall submit a point-by-point statement of compliance with each paragraph of the security specification. The statement of compliance shall list each paragraph by number and indicate “COMPLY” opposite the number for each paragraph where the Contractor fully complies with the specification. Where the proposed system cannot meet the requirements of the paragraph, and does not offer an equivalent solution, the offers shall indicate “DOES NOT COMPLY” opposite the paragraph number. Where the proposed system does not comply with the paragraph as written, but the bidder feels it will accomplish the intent of the paragraph in a manner different from that described, the offers shall indicate “COMPARABLE”. The offers shall include a statement fully describing the “comparable” method of satisfying the requirement. Where a full and concise description is not provided, the offered system shall be considered as not complying with the specification. Any submission that does not include a point-by-point statement of compliance, as described above, shall be disqualified. Submittals for products shall be in precise order with the product section of the specification. Submittals not in proper sequence will be rejected.

1.17 LIKE ITEMS

A. Where two or more items of equipment performing the same function are required, they shall be exact duplicates produced by one manufacturer. All equipment provided shall be complete, new, and free of any defects.

1.18 WARRANTY

A. The Contractor shall, as a condition precedent to the final payment, execute a written guarantee (warranty) to the COTR certifying all contract requirements have been completed according to the final specifications. Contract drawings and the warranty of all materials and equipment furnished under this contract are to remain in satisfactory operating condition (ordinary wear and tear, abuse and causes beyond his control for this work accepted) for one (1) year from the date the Contactor received written notification of final acceptance from the COTR. Demonstration and training shall be performed prior to system acceptance. All defects or damages due to faulty materials or workmanship shall be repaired or replaced without delay, to the COTR's satisfaction, and at the Contractor's expense. The Contractor shall provide quarterly inspections during the warranty period. The contractor shall provide written documentation to the COTR on conditions and findings of the system and device(s). In addition, the contractor shall provide written documentation of test results and stating what was done to correct any deficiencies. The first inspection shall occur 90 calendar days after the acceptance date. The last inspection shall occur 30 calendar days prior to the end of the warranty. The warranty period shall be extended until the last inspection and associated corrective actions are complete. When equipment and labor covered by the Contractor's warranty, or by a manufacturer's warranty, have been replaced or restored because of it’s failure during the warranty period, the warranty period for the replaced or repaired equipment or restored work shall be reinstated for a period equal to the original warranty period, and commencing with the date of completion of the replacement or restoration work. In the event any manufacturer customarily provides a warranty

period greater than one (1) year, the Contractor's warranty shall be for the same duration for that component.

1.19 SINGULAR NUMBER

Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

PART 2 – PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. All equipment associated within the Security Control Room, Security Console and Security Equipment Room shall be UL 827, UL 1981, and UL 60950 compliant and rated for continuous operation. Environmental conditions (i.e. temperature, humidity, wind, and seismic activity) shall be taken under consideration at each facility and site location prior to installation of the equipment.

B. All equipment shall operate on a 120 or 240 volts alternating current (VAC); 50 Hz or 60 Hz AC power system unless documented otherwise in subsequent sections listed within this specification. All equipment shall have a back-up source of power that will provide a minimum of [8] hours of run time in the event of a loss of primary power to the facility.

C. The system shall be designed, installed, and programmed in a manner that will allow for ease of operation, programming, servicing, maintenance, testing, and upgrading of the system.

D. All equipment and materials for the system will be compatible to ensure correct operation.

2.2 EQUIPMENT ITEMS

A. Wires and Cables:

1. Shall meet or exceed the manufactures recommendation for power and signals.
2. Shall be carried in an enclosed conduit system, utilizing electromagnetic tubing (EMT) to include the equivalent in flexible metal, rigid galvanized steel (RGS) to include the equivalent of liquid tight, polyvinylchloride (PVC) schedule 40 or 80.
3. All conduits will be sized and installed per the NEC. All security system signal and power cables that traverse or originate in a high security office space will contained in either EMT or RGS conduit.
4. All conduit, pull boxes, and junction boxes shall be marked with colored permanent tape or paint that will allow it to be distinguished from all other infrastructure conduit.
5. Conduit fills shall not exceed 50 percent unless otherwise documented.
6. A pull string shall be pulled along and provided with signal and power cables to assist in future installations.
7. At all locations where there is a wall penetration or core drilling is conducted to allow for conduit to be installed, fire stopping materials shall be applied to that area.

8. High voltage and signal cables shall not share the same conduit and shall be kept separate up to the point of connection. High voltage for the security subsystems shall be any cable or sets of cables carrying 30 VDC/VAC or higher.
9. For all equipment that is carrying digital data between the Security Control Room, Security Equipment Room, Security Console, or at a remote monitoring station, it shall not be less that 20 AWG and stranded copper wire for each conductor. The cable or each individual conductor within the cable shall have a shield that provides 100% coverage. Cables with a single overall shield shall have a tinned copper shield drain wire.

2.3 TRANSIENT VOLTAGE SURGE SUPPRESSION DEVICES (TVSS) AND SURGE SUPPRESION

A. Intercom Systems
   1. Suppressors shall be installed on the AC power at the point of service and shall meet the following criteria:
      a. UL 1449 Listed
      b. UL 1449 S.V.R. of 400 Volts or lower
      c. Diagnostic Indicator Light(s)
      d. Integrated ground terminating post (where case/chassis ground exists)
      e. Minimum Surge Current Capacity of 13,000 Amps (8 x 20 µSec)
   2. Suppressors shall be installed on incoming central office lines and shall meet the following criteria:
      a. UL 497A Listed
      b. Multi Stage protection design
      c. Auto-reset current protection not to exceed 2 Amps per pair
      d. Minimum Surge Current of 500 Amps per pair (8 x 20 µSec)
   3. Suppressors shall be installed on all telephone/intercom circuits that enter or leave separate buildings and shall meet the following criteria:
      a. UL 497A Listed (where applicable)
      b. UL 497B Listed (horns, strobes, speakers or communication circuits over 300 feet)
      c. Multi Stage protection design
      d. Auto-reset over-current protection not to exceed 5 Amps per pair
      e. Minimum Surge Current of 1000 Amps per pair (8 x 20 µSec)

B. Grounding and Surge Suppression
   1. The Security Contractor shall provide grounding and surge suppression to stabilize the voltage under normal operating conditions. This is to ensure the operation of over current devices, such as fuses, circuit breakers, and relays, underground-fault conditions.
   2. The Contractor shall engineer, provide, ad install proper grounding and surge suppression as required by local jurisdiction and prevailing codes and standards, referenced in this document.

3. Principal grounding components and features shall include: main grounding buses, grounding, and bonding connections to service equipment.
4. The Contractor shall provide detail drawings of interconnection with other grounding systems including lightning protection systems.
5. The Contractor shall provide details of locations and sizes of grounding conductors and grounding buses in electrical, data, and communication equipment rooms and closets.
6. AC power receptacles are not to be used as a ground reference point.
7. Any cable that is shielded shall require a ground in accordance with applicable codes, the best practices of the trade, and all manufactures' installation instructions.

C. 120 VAC Surge Suppression
1. Continuous Current: Unlimited (parallel connection)
2. Max Surge Current: 13,500 Amps
3. Protection Modes: L - N, L - G, N - G
4. Warranty: Ten Year Limited Warranty
5. Dimension: 73.7 x 41.1 x 52.1 mm (2.90 x 1.62 x 2.05 in)
6. Weight: 2.88 g (0.18 lbs)
7. Housing: ABS

2.4 INSTALLATION KIT

A. General:
1. The kit shall be provided that, at a minimum, includes all connectors and terminals, labeling systems, audio spade lugs, barrier strips, punch blocks or wire wrap terminals, heat shrink tubing, cable ties, solder, hangers, clamps, bolts, conduit, cable duct, and/or cable tray, etc., required to accomplish a neat and secure installation. All wires shall terminate in a spade lug and barrier strip, wire wrap terminal or punch block. Unfinished or unlabeled wire connections shall not be allowed. All unused and partially opened installation kit boxes, coaxial, fiber-optic, and twisted pair cable reels, conduit, cable tray, and/or cable duct bundles, wire rolls, physical installation hardware shall be turned over to the Contracting Officer. The following sections outline the minimum required installation sub-kits to be used:
2. System Grounding:
   a. The grounding kit shall include all cable and installation hardware required. All head end equipment and power supplies shall be connected to earth ground via internal building wiring, according to the NEC.
   b. This includes, but is not limited to:
      1) Coaxial Cable Shields
      2) Control Cable Shields
      3) Data Cable Shields
      4) Equipment Racks

5) Equipment Cabinets
6) Conduits
7) Cable Duct blocks
8) Cable Trays
9) Power Panels
10) Grounding
11) Connector Panels

3. Coaxial Cable: The coaxial cable kit shall include all coaxial connectors, cable tying straps, heat shrink tabbing, hangers, clamps, etc., required to accomplish a neat and secure installation.
4. Wire and Cable: The wire and cable kit shall include all connectors and terminals, audio spade lugs, barrier straps, punch blocks, wire wrap strips, heat shrink tubing, tie wraps, solder, hangers, clamps, labels etc., required to accomplish a neat and orderly installation.
5. Conduit, Cable Duct, and Cable Tray: The kit shall include all conduit, duct, trays, junction boxes, back boxes, cover plates, feed through nipples, hangers, clamps, other hardware required to accomplish a neat and secure conduit, cable duct, and/or cable tray installation in accordance with the NEC and this document.
6. Equipment Interface: The equipment kit shall include any item or quantity of equipment, cable, mounting hardware and materials needed to interface the systems with the identified sub-system(s) according to the OEM requirements and this document.
7. Labels: The labeling kit shall include any item or quantity of labels, tools, stencils, and materials needed to label each subsystem according to the OEM requirements, as-installed drawings, and this document.
8. Documentation: The documentation kit shall include any item or quantity of items, computer discs, as installed drawings, equipment, maintenance, and operation manuals, and OEM materials needed to provide the system documentation as required by this document and explained herein.

PART 3 – EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

F. Equipment location shall be as close as practical to locations shown on the drawings.

G. Inaccessible Equipment:

1. Where the Government determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.
2. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.

3.2 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section 07 84 00 "Firestopping."

3.3 COMMISIONING

A. Provide commissioning documentation in accordance with the requirements of Section 28 08 00 – COMMISIONIN OF ELECTRONIC SAFETY AND SECURITY SYSTEMS for all inspection, start up, and contractor testing required above and required by the System Readiness Checklist provided by the Commissioning Agent.

B. Components provided under this section of the specification will be tested as part of a larger system. Refer to section 28 08 00 – COMMISIONING OF ELECTRONIC SAFETY AND SECURITY SYSTEMS and related sections for contractor responsibilities for system commissioning.

3.4 DEMONSTRATION AND TRAINING

A. Training shall be provided in accordance with Article, INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.

B. Training shall be provided for the particular equipment or system as required in each associated specification.

C. A training schedule shall be developed and submitted by the contractor and approved by the Resident Engineer at least 30 days prior to the planned training.

D. Provide services of manufacturer’s technical representative for <insert hours> hours to instruct VA personnel in operation and maintenance of units.

E. Submit training plans and instructor qualifications in accordance with the requirements of Section 28 08 00 – COMMISIONING OF ELECTRONIC SAFETY AND SECURITY SYSTEMS.

3.5 WORK PERFORMANCE

A. Job site safety and worker safety is the responsibility of the contractor.

B. For work on existing stations, arrange, phase and perform work to assure electronic safety and security service for other buildings at all times. Refer to Article OPERATIONS AND STORAGE AREAS under Section 01 00 00, GENERAL REQUIREMENTS.

C. New work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Section 01 00 00, GENERAL REQUIREMENTS.

D. Coordinate location of equipment and conduit with other trades to minimize interferences. See the GENERAL CONDITIONS.

3.6 SYSTEM PROGRAMMING

A. General Programming Requirements

1. This following section shall be used by the contractor to identify the anticipated level of effort (LOE) required setup, program, and configure the Electronic Security System (ESS). The contractor shall be responsible for providing all setup, configuration, and programming to include data entry for the Security Management System (SMS) and subsystems [(e.g., video matrix switch, intercoms, digital video recorders, intrusion devices, including integration of subsystems to the SMS (e.g., camera call up, time synchronization, intercoms)]. System programming for existing or new SMS servers shall not be conducted at the project site.

B. Level of Effort for Programming

1. The Contractor shall perform and complete system programming (including all data entry) at an offsite location using the Contractor's own copy of the SMS software. The Contractor's copy of the SMS software shall be of the Owners current version. Once system programming has been completed, the Contractor shall deliver the data to the Resident Engineer on data entry forms and an approved electronic medium, utilizing data from the contract documents. The completed forms shall be delivered to the Resident Engineer for review and approval at least 90 calendar days prior to the scheduled date the Contractor requires it. The Contractor shall not upload system programming until the Resident Engineer has provided written approval. The Contractor is responsible for backing up the system prior to uploading new programming data.
2. The Contractor shall identify and request from the Resident Engineer, any additional data needed to provide a complete and operational system as described in the contract documents.

3.7 TESTING AND ACCEPTANCE

A. Performance Requirements

1. General:
    a. The Contractor shall perform contract field, performance verification, and endurance testing and make adjustments of the completed security system when permitted. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all testing. Written notification of planned testing shall be given to the Resident Engineer at least 60 calendar days prior to the test and after the Contractor has received written approval of the specific test procedures.
    b. The COTR shall witness all testing and system adjustments during testing. Written permission shall be obtained from the Resident Engineer before proceeding with the next phase of testing.

Original copies of all data produced during performance verification and endurance testing shall be turned over to the Resident Engineer at the conclusion of each phase of testing and prior to Resident Engineer approval of the test.

2. Test Procedures and Reports: The test procedures, compliant w/ VA standard test procedures, shall explain in detail, step-by-step actions and expected results demonstrating compliance with the requirements of the specification. The test reports shall be used to document results of the tests. The reports shall be delivered to the Resident Engineer within seven (7) calendar days after completion of each test.

B. Contractor's Field Testing (CFT)

1. The Contractor shall calibrate and test all equipment, verify DTM operation, place the integrated system in service, and test the integrated system. Ground rods installed by this Contractor within the base of camera poles shall be tested as specified in IEEE STD 142. The Contractor shall test all security systems and equipment, and provide written proof of a 100% operational system before a date is established for the system acceptance test. Documentation package for CFT shall include completed (fully annotated details of test details) for each device and system tested, and annotated loading sheets documenting complete testing to Resident Engineer approval. CFT test documentation package shall conform to submittal requirements outlined in this Section. The Contractor's field testing procedures shall be identical to the Resident Engineer's acceptance testing procedures. The Contractor shall provide the Resident Engineer with a written listing of all equipment and software indicating all equipment and components have been tested and passed. The Contractor shall deliver a written report to theResident Engineer stating the installed complete system has been calibrated, tested, and is ready to begin performance verification testing; describing the results of the functional tests, diagnostics, and calibrations; and the report shall also include a copy of the approved acceptance test procedure. Performance verification testing shall not take place until written notice by contractor is received certifying that a contractors field test was successful.

C. Performance Verification Test (PVT)

1. Test team:

a. After the system has been pretested and the Contractor has submitted the pretest results and certification to the Resident Engineer, then the Contractor shall schedule an acceptance test to date and give the Resident Engineer written, notice as described herein, prior to the date the acceptance test is expected to begin. The system shall be tested in the presence of a Government Representative, an OEM certified representative, representative of the Contractor and other approved by the Resident Engineer. The system shall be tested utilizing the approved test equipment to certify proof of performance, FCC, UL and Emergency Service compliance. The test shall verify that the total system meets all the requirements of this specification. The notification of the acceptance test shall include the expected length (in time) of the test.

2. The Contractor shall demonstrate the completed Physical Access Control System PACS complies with the contract requirements. In addition, the Contractor shall provide written certification that the system is 100% operational prior to establishing a date for starting PVT. Using approved test procedures, all physical and functional requirements of the project shall be demonstrated and shown. The PVT will be stopped and aborted as soon as 10 technical deficiencies are found requiring correction. The Contractor shall be responsible for all travel and lodging expenses incurred for out-of-town personnel required to be present for resumption of the PVT. If the acceptance test is aborted, the re-test will commence from the beginning with a retest of components previously tested and accepted.
3. The PVT, as specified, shall not begin until receipt of written certification that the Contractors Field Testing was successful. This shall include certification of successful completion of testing as specified in paragraph "Contractor's Field Testing", and upon successful completion of testing at any time when the system fails to perform as specified. Upon termination of testing by the Resident Engineer or Contractor, the Contractor shall commence an assessment period as described for Endurance Testing Phase II.
4. Upon successful completion of the acceptance test, the Contractor shall deliver test reports and other documentation, as specified, to the Resident Engineer prior to commencing the endurance test.
5. Additional Components of the PVT shall include:
    a. System Inventory
        1) All Device equipment
        2) All Software
        3) All Logon and Passwords
        4) All Cabling System Matrices
        5) All Cable Testing Documents
        6) All System and Cabinet Keys
    b. Inspection
        1) Contractor shall record an inspection punch list noting all system deficiencies. The contractor shall prepare an inspection punch list format for Resident Engineers approval.
        2) As a minimum the punch list shall include a listing of punch list items, punch list item location, description of item problem, date noted, date corrected, and details of how item was corrected.
6. Partial PVT - At the discretion of Resident engineer, the Performance Verification Test may be performed in part should a 100% compliant CFT be performed. In the event that a partial PVT will be performed instead of a complete PVT; the partial PVT shall be performed by testing 10% of the system. The contractor shall perform a test of each procedure on select devices or equipment.

D. Endurance Test
1. The Contractor shall demonstrate the specified probability of detection and false alarm rate requirements of the completed system. The endurance test shall be conducted in phases as specified

below. The endurance test shall not be started until the Resident Engineer notifies the Contractor, in writing, that the performance verification test is satisfactorily completed, training as specified has been completed, and correction of all outstanding deficiencies has been satisfactorily completed. VA shall operate the system 24 hours per day, including weekends and holidays, during Phase I and Phase III endurance testing. VA will maintain a log of all system deficiencies. The Resident Engineer may terminate testing at any time the system fails to perform as specified. Upon termination of testing, the Contractor shall commence an assessment period as described for Phase II. During the last day of the test, the Contractor shall verify the appropriate operation of the system. Upon successful completion of the endurance test, the Contractor shall deliver test reports and other documentation as specified to the Resident Engineer prior to acceptance of the system.

2. Phase I (Testing): The test shall be conducted 24 hours per day for 15 consecutive calendar days, including holidays, and the system shall operate as specified. The Contractor shall make no repairs during this phase of testing unless authorized in writing by the Resident Engineer. If the system experiences no failures, the Contractor may proceed directly to Phase III testing after receiving written permission from the Resident Engineer.
3. Phase II (Assessment):
    a. After the conclusion of Phase I, the Contractor shall identify all failures, determine causes of all failures, repair all failures, and deliver a written report to the Resident Engineer. The report shall explain in detail the nature of each failure, corrective action taken, results of tests performed, and recommend the point at which testing should be resumed.
    b. After delivering the written report, the Contractor shall convene a test review meeting at the job site to present the results and recommendations to the Resident Engineer. The meeting shall not be scheduled earlier than five (5) business days after the Resident Engineer receives the report. As part of this test review meeting, the Contractor shall demonstrate all failures have been corrected by performing appropriate portions of the performance verification test. Based on the Contractor's report and the test review meeting, the Resident Engineer will provide a written determine of either the restart date or require Phase I be repeated.
4. Phase III (Testing): The test shall be conducted 24 hours per day for 15 consecutive calendar days, including holidays, and the system shall operate as specified. The Contractor shall make no repairs during this phase of testing unless authorized in writing by the COTR.
5. Phase IV (Assessment):
    1. After the conclusion of Phase III, the Contractor shall identify all failures, determine causes of all failures, repair all failures, and deliver a written report to the COTR. The report shall explain in detail the nature of each failure, corrective action taken, results of tests performed, and recommend the point at which testing should be resumed.
    2. After delivering the written report, the Contractor shall convene a test review meeting at the job site to present the results and recommendations to the COTR. The meeting shall not be scheduled

earlier than five (5) business days after receipt of the report by the COTR. As a part of this test review meeting, the Contractor shall demonstrate that all failures have been corrected by repeating appropriate portions for the performance verification test. Based on the review meeting the test should not be scheduled earlier than five (5) business days after the Resident Engineer receives the report. As a part of this test review meeting, the Contractor shall demonstrate all failures have been corrected by repeating appropriate portions of the performance verification test. Based on the Contractor's report and the test review meeting, the Resident Engineer will provide a written determine of either the restart date or require Phase III be repeated. After the conclusion of any re-testing which the Resident Engineer may require, the Phase IV assessment shall be repeated as if Phase III had just been completed.

E. Exclusions

1. The Contractor will not be held responsible for failures in system performance resulting from the following:
    a. An outage of the main power in excess of the capability of any backup power source provided the automatic initiation of all backup sources was accomplished and that automatic shutdown and restart of the PACS performed as specified.
    b. Failure of an Owner furnished equipment or communications link, provided the failure was not due to Contractor furnished equipment, installation, or software.
    c. Failure of existing Owner owned equipment, provided the failure was not due to Contractor furnished equipment, installation, or software.

END OF SECTION

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY
SECTION 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. RS-232 cabling.
2. RS-485 cabling.
3. Low-voltage control cabling.
4. Control-circuit conductors.
5. Fire alarm wire and cable.
6. Identification products.

1.2 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. EMI: Electromagnetic interference.

C. IDC: Insulation displacement connector.

D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

E. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

F. RCDD: Registered Communications Distribution Designer.

1.3 SUBMITTALS

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

1. For coaxial cable, include the following installation data for each type used:

a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.

B. Shop Drawings: Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:

1. Vertical and horizontal offsets and transitions.
2. Clearances for access above and to side of cable trays.
3. Vertical elevation of cable trays above the floor or bottom of ceiling structure.

C. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

D. Source quality-control reports.

E. Field quality-control reports.

F. Operation and Maintenance Data: For wire and cable to include in operation and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Allowable pulling tension of cable.
2. Cable connectors and terminations recommended by the manufacturer.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: 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.

1. Flame-Spread Index: **25** or less.
2. Smoke-Developed Index: **50** or less.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1.6 PROJECT CONDITIONS

A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.

1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.

B. Environmental Limitations: Do not deliver or install UTP, optical fiber, and coaxial cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 UTP CABLE AND HARDWARE

A. Comply with Division 27 “Communications horizontal cabling”

2.2 OPTICAL FIBER CABLE and OPTICAL FIBER CABLE HARDWARE

A. Comply with Division 27 “Communications backbone cabling”

2.3 COAXIAL CABLE AND HARDWARE

A. Comply with Division 27 “Communications backbone cabling’ and Division 27 communications horizontal cabling”.

2.4 RS-232 CABLE

A. Standard Cable: NFPA 70, Type CM.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Polypropylene insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. PVC jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.5 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CM.

1. Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.6 LOW-VOLTAGE CONTROL CABLE

A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. 1 pair, twisted, **No. 16 AWG, stranded (19x29)** tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.7 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.

B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

2.8 FIRE ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Comtran Corporation.
2. Draka Cableteq USA.
3. Genesis Cable Products; Honeywell International, Inc.
4. Rockbestos-Suprenant Cable Corp.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.
3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with red identifier stripe, NTRL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

2.9 IDENTIFICATION PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. HellermannTyton.
3. Kroy LLC.
4. PANDUIT CORP.
5. Encore Wire

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Division 26 Section "Electrical Identification."

2.10 SOURCE QUALITY CONTROL

A. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.

B. Factory test UTP cables according to TIA/EIA-568-B.2.

C. Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.

D. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

E. Cable will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

A. Comply with requirements in Division 26 Section "Raceways and Boxes" for installation of conduits and wireways.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems" for installation of supports for pathways, conductors and cables.

3.3 WIRING METHOD

A. Install wiring in raceways except in accessible indoor ceiling spaces and in interior hollow gypsum board partitions where cable may be used. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be 3/4 inch (21 mm). Control and data transmission wiring shall not share conduit with other building wiring systems.

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

3.4 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.

C. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1525 mm) apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (75 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.5 FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceways and Boxes."

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

F. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

G. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.6 POWER AND CONTROL-CIRCUIT CONDUCTORS

A. 120-V Power Wiring: Install according to Division 26 Section "Conductors and Cables" unless otherwise indicated.

B. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No. 14 AWG.
2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.7 FIRESTOPPING

A. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

B. Comply with TIA-569-B, "Firestopping" Annex A.

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.8 GROUNDING

A. For communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding."

3.9 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Electrical Identification."

3.10 FIELD QUALITY CONTROL

A. Testing Agency: **Engage** a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

D. Prepare test and inspection reports.

END OF SECTION

DIVISION 28 - ELECTRICAL
SECTION 28 05 26 - GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the finishing, installation, connection, testing and certification of the grounding and bonding required for a fully functional Electronic Safety and Security (ESS) system.

B. “Grounding electrode system” refers to all electrodes required by NEC, as well as including made, supplementary, grounding electrodes.

C. The terms “connect” and “bond” are used interchangeably in this specification and have the same meaning

1.2 RELATED WORK

A. Section 01 00 00 - GENERAL REQUIREMENTS. For General Requirements.

B. Section 28 05 00 - REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATIONS. For general electrical requirements, quality assurance, coordination, and project conditions that are common to more than one section in Division 28.

C. Section 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for low voltage power and lighting wiring.

1.3 SUBMITTALS

A. Submit in accordance with Section 28 05 00, COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY.

B. Shop Drawings:

1. Clearly present enough information to determine compliance with drawings and specifications.
2. Include the location of system grounding electrode connections and the routing of aboveground and underground grounding electrode conductors.

C. Test Reports: Provide certified test reports of ground resistance.

D. Certifications: Two weeks prior to final inspection, submit four copies of the following to the COTR:

1. Certification that the materials and installation are in accordance with the drawings and specifications.
2. Certification by the contractor that the complete installation has been properly installed and tested.

1.4 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. American Society for Testing and Materials (ASTM):

B1-07.....Standard Specification for Hard-Drawn Copper Wire

B3-07.....Standard Specification for Soft or Annealed Copper Wire

B8-04.....Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

C. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

81-1983 .....IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

C2-07.....National Electrical Safety Code

D. National Fire Protection Association (NFPA):

70-11 .....National Electrical Code (NEC)

99-2005 .....Health Care Facilities

E. Underwriters Laboratories, Inc. (UL):

44-05 .....Thermoset-Insulated Wires and Cables

83-08 .....Thermoplastic-Insulated Wires and Cables

467-07 .....Grounding and Bonding Equipment

486A-486B-03 .....Wire Connectors

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

A. Equipment grounding conductors shall be UL 83 insulated stranded copper, except that sizes 6 mm² (10 AWG) and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes 25 mm² (4 AWG) and larger shall be permitted to be identified per NEC.

B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes 6 mm² (10 AWG) and smaller shall be ASTM B1 solid bare copper wire.

2.2 GROUND RODS

A. Copper clad steel, 19 mm (3/4-inch) diameter by 3000 mm (10 feet) long, conforming to UL 467.

B. Quantity of rods shall be as required to obtain the specified ground resistance.

2.3 SPLICES AND TERMINATION COMPONENTS

A. Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).2.4 ground connections

B. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

C. Below Grade: Exothermic-welded type connectors.

D. Above Grade:

1. Bonding Jumpers: Compression-type connectors, using zinc-plated fasteners and external tooth lockwashers.
2. Connection to Building Steel: Exothermic-welded type connectors.
3. Ground Busbars: Two-hole compression type lugs, using tin-plated copper or copper alloy bolts and nuts.
4. Rack and Cabinet Ground Bars: One-hole compression-type lugs, using zinc-plated or copper alloy fasteners.

5. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
   a) Pipe Connectors: Clamp type, sized for pipe.
6. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 EQUIPMENT RACK AND CABINET GROUND BARS

A. Provide solid copper ground bars designed for mounting on the framework of open or cabinet-enclosed equipment racks with minimum dimensions of 4 mm thick by 19 mm wide (3/8 inch x ¾ inch).

2.5 GROUND TERMINAL BLOCKS

A. At any equipment mounting location (e.g., backboards and hinged cover enclosures) where rack-type ground bars cannot be mounted, provide screw lug-type terminal blocks.

2.6 SPLICE CASE GROUND ACCESSORIES

A. Splice case grounding and bonding accessories shall be supplied by the splice case manufacturer when available. Otherwise, use 16 mm² (6 AWG) insulated ground wire with shield bonding connectors.

2.7 COMPUTER ROOM GROUND

A. Provide 50mm2 (1/0 AWG) bare copper grounding conductors bolted at mesh intersections to form an equipotential grounding grid. The equipotential grounding grid shall form a 600mm (24 inch) mesh pattern. The grid shall be bonded to each of the access floor pedestals.

2.8 SECURITY CONTROL ROOM GROUND

A. Provide 50mm2 (1/0 AWG) stranded copper grounding conductor(s) color coded with a green jacket, bolted at the Room's Communications System Grounding Electrode Cooper Plate and circulate to each equipment rack ground buss bar through the wire management system. Connect each equipment rack, wire management system's cable tray, ladder, etc. to the circulating ground wire with a minimum 25mm2 (4AWG) stranded Cooper Wire, color coded with a green jacket.
   1. Connect each equipment rack ground buss bar to the circulating ground wire a indicated in 2.9.A, and
   2. Connect each additional room item to the circulating ground wire as indicated in 2.9.A.

PART 3 - EXECUTION

3.1 GENERAL

A. Ground in accordance with the NEC, as shown on drawings, and as specified herein.

B. System Grounding:
   1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformers.
   2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.

C. Equipment Grounding: Metallic structures, including ductwork and building steel, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits, shall be bonded and grounded.

3.2 INACCESSIBLE GROUNDING CONNECTIONS

A. Make grounding connections, which are buried or otherwise normally inaccessible (except connections for which periodic testing access is required) by exothermic weld.

3.3 CORROSION INHIBITORS

A. When making ground and ground bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

3.4 CONDUCTIVE PIPING

A. Bond all conductive piping systems, interior and exterior, to the building to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.

3.5 COMPUTER ROOM/SECURITY EQUIPMENT ROOM GROUNDING

A. Conduit: Ground and bond metallic conduit systems as follows:
   1. Ground metallic service conduit and any pipes entering or being routed within the computer room at each end using 16 mm² (6AWG) bonding jumpers.
   2. Bond at all intermediate metallic enclosures and across all joints using 16 mm² (6 AWG) bonding jumpers.

3.6 WIREWAY GROUNDING

A. Ground and Bond Metallic Wireway Systems as follows:
   1. Bond the metallic structures of wireway to provide 100 percent electrical continuity throughout the wireway system by connecting a 16 mm² (6 AWG) bonding jumper at all intermediate metallic enclosures and across all section junctions.
   2. Install insulated 16 mm² (6 AWG) bonding jumpers between the wireway system bonded as required in paragraph 1 above, and the closest building ground at each end and approximately every 16 meters (50 feet).
   3. Use insulated 16 mm² (6 AWG) bonding jumpers to ground or bond metallic wireway at each end at all intermediate metallic enclosures and cross all section junctions.
   4. Use insulated 16 mm² (6 AWG) bonding jumpers to ground cable tray to column-mounted building ground plates (pads) at each end and approximately every 15 meters.

3.7 LABELING

A. Comply with requirements in Division 26 Section "ELECTRICAL IDENTIFICATION" Article for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer.
   1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal at individual ground rods. Make tests at ground rods before any conductors are connected.
    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power Distribution Units or Panel boards Serving Electronic Equipment: 3 ohm(s).
2. Manhole Grounds: 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

DIVISION 28 – ELECTRICAL
SECTION 28 31 11 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Notification appliances.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Magnetic door holders.

1.2 DEFINITIONS

A. NICET: National Institute for Certification in Engineering Technologies.

1.3 SYSTEM DESCRIPTION

A. Noncoded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

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

B. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with 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 air-handling system is operating.
5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
6. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

C. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:
   a. Trained and certified by manufacturer in fire-alarm system design.
   b. NICET-certified fire-alarm technician, Level IV minimum.
   c. Licensed or certified by authorities having jurisdiction.

D. Delegated-Design Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
   a. Frequency of testing of installed components.

b. Frequency of inspection of installed components.
c. Requirements and recommendations related to results of maintenance.
d. Manufacturer's user training manuals.

5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
3. Keys and Tools: One extra set for access to locked and tamperproofed components.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.10 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

1. Fire-Lite Alarms.
2. GAMEWELL.
3. GE UTC Fire & Security; A United Technologies Company.
4. Notifier.

2.2 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.

2.3 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.

2. Detectors shall be two-wire type.

3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Smoke detectors in duct work shall be photo electric type furnished and connected under Division 16, installation in duct work shall be accomplished under Division 15.
2. Power supply for detectors shall be 24 volts D.C. and supplied from fire alarm control panel.
3. Provide contacts to automatically shut down fan motors.
4. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
5. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

a. Primary status.
b. Device type.
c. Present average value.
d. Present sensitivity selected.
e. Sensor range (normal, dirty, etc.).

6. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
7. Each sensor shall have multiple levels of detection sensitivity.
8. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions were applied.
9. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.
10. Provide remote station having LED to indicate alarm condition and key switch to test and reset alarm relay at a readily accessible location for all duct detectors that are not readily accessible.

    a. In mechanical room mount remote station 6'-0" above finished floor.
    b. Where air handling unit or damper is above ceiling, mount remote station in wall below ceiling or in ceiling.

11. Detectors for air handling equipment rated over 2000 CFM, but less than 15,000 CFM shall be located in the supply duct.
12. Location of duct detectors shown is schematic in nature only. Verify exact location with unit and duct work placement.
13. Where duct detector is required to be on building exterior, provide weatherproof detector and 120 volt power as required.
14. Provide control modules at each detector. Modules shall be connected and programmed to close dampers and shunt down air handling units as required to meet building codes. Coordinate sequence of operation with mechanical.

2.4 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.5 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

B. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.

C. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.

D. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.

1. Rated Light Output:
   a. Refer to drawings.
   b. 15/30/75/110 cd, selectable in the field.
2. Mounting: Wall mounted unless otherwise indicated on drawings.
3. Flashing shall be in a temporal pattern, synchronized with other units.
4. Strobe Leads: Factory connected to screw terminals.
5. Mounting Faceplate: Factory finished, white.

E. Speaker/Strobe or Speaker:

1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
2. High-Range Units: Rated 2 to 15 W.
3. Low-Range Units: Rated 1 to 2 W.
4. Mounting: Flush.
5. Matching Transformers: Tap range matched to acoustical environment of speaker location.

2.6 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V ac or dc.

B. Material and Finish: Match door hardware.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment

B. Audible Alarm-Indicating Devices: Install as indicated on drawings. Install speakers or horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

C. Visible Alarm-Indicating Devices: Install as indicated on drawings. Install devices on flush-mounted back boxes.

3.2 FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceways and Boxes."

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.
   a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
   b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: One year after date of Material Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

DIVISION 31 – EARTHWORK
SECTION 31 20 00 – EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Earthwork including excavation, fill, backfill, and lawn restoration.

1.2 RELATED REQUIREMENTS

A. Materials testing and inspection during construction: Section 01 40 00, Quality Requirements.

1.3 MEASUREMENT AND PAYMENT FOR ROCK EXCAVATION

A. Measurement: Cross section and measure the uncovered and separated materials, and compute quantities by the Registered Professional Land Surveyor or Registered Civil Engineer, specified in Section 01 40 00, Quality Requirements. Do not measure quantities beyond the following limits:
   1. 300 mm (12 inches) outside of the perimeter of formed footings.
   2. 600 mm (24 inches) outside the face of concrete work when forms are required, except for footings.
   3. 150 mm (6 inches) below the bottom of pipe and maximum the pipe diameter plus 600 mm (24 inches) in width for pipe trenches.
   4. Outside dimensions of concrete work when no forms are required (trenches, conduits, and similar items not requiring forms).

B. Payment for Differing Site Conditions: When rock excavation, as classified, is encountered, the contract price and time will be adjusted according to Articles, Differing Site Conditions, Changes and Changes-Supplement of the General Requirements as applicable.

1.4 DEFINITIONS

A. Unsuitable Materials:
   1. Fills: Topsoil, frozen materials; construction materials and materials subject to decomposition; clods of clay and stones larger than 75 mm (3 inches); organic materials, including silts, which are unstable; and inorganic materials, including silts, too wet to be stable.
   2. Existing Subgrade (except footings): Same materials as above paragraph, not capable of direct support of slabs, pavement, and similar items, with the possible exception of improvement by compaction, proof rolling, or similar methods of improvement.

B. Earthwork: Earthwork operations required within the new construction area. Also includes earthwork required for auxiliary structures and buildings and sewer and other trench work throughout the job site.

C. Degree of Compaction: Degree of compaction is expressed as a percentage of maximum density obtained by the test procedure presented in ASTM D1557.

D. The term fill means fill or backfill.

E. Topsoil: Fertile, friable, natural topsoil of loamy character and characteristic of locality, capable of growing healthy horticultural crops of grasses.

1.5 CLASSIFICATION OF EXCAVATION

A. Unclassified Excavation: Removal and disposal of pavements and other man-made obstructions visible on the surface; utilities, and other items including underground structures indicated to be

demolished and removed; together with any type of materials regardless of character of material and obstructions encountered.

B. Rock Excavation:
1. Solid ledge rock (igneous, metamorphic, and sedimentary rock).
2. Bedded or conglomerate deposits, cemented to present characteristics of solid rock which cannot be excavated without blasting; or the use of modern power excavator (shovel, backhoe, or similar power excavators) minimum 0.75 m3 (1 cubic yard) capacity, properly used, having adequate power and in good running condition.
3. Boulders or other detached stones each having a volume of 0.4 cubic meter (1/2 cubic yard) or more.

1.6 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):
1. D1557-07 - Laboratory Compaction Characteristics of Soil Using Modified Effort.

1.7 SUBMITTALS

A. Submittal Procedures: Section 01 33 00, Submittals.

B. Submittal Drawings:
1. Show size, configuration, and fabrication and installation details.
2. Plot plan showing elevations.

C. Test Reports: Certify products comply with specifications.
1. Rock Excavation Report:
2. Certification of rock quantities excavated.
a. Excavation method.
b. Labor.
c. Equipment.

1.8 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fills: Materials approved from on site and off site sources.
1. Dry Density: 1760 kg/m3 (110 pcf) minimum.
2. Plasticity Index: 6 maximum.
3. Liquid Limit: 30 maximum.

B. Granular Fill:
1. Bedding for Sanitary and Storm Sewer Pipe, crushed stone or gravel graded from 13 mm (1/2 inch) to 4.75 mm (No. 4).

PART 3 - EXECUTION

3.1 SITE PREPARATION

A. Clearing:
1. Clear within the limits of earthwork operations as described or designated by the Architect/Engineer.
2. Remove trees, shrubs, fences, foundations, incidental structures, paving, debris, trash and any other obstructions.
3. Remove materials from the Cemetery Property.

B. Grubbing:
1. Remove stumps and roots 75 mm (3 inches) and larger diameter.
2. Leave undisturbed sound stumps, roots up to 75 mm (3 inches) diameter, and nonperishable solid objects minimum 900 mm (3 feet) below subgrade or finished embankment.
3. Do not leave material within the burial profile up to 2400 mm (8 feet) below finished grade.

C. Trees and Shrubs:
1. Remove trees and shrubs, not shown for removal, within 4500 mm (15 feet) of new construction and 2250 mm (7’-6”) of utility lines when approved in advance by the Architect/Engineer.
2. Remove materials from the Cemetery Property.
3. Protect from damage, existing trees and shrubs. Trim, clean, and paint existing trees and shrubs including the roots, according to standard industry horticultural practice for the geographic area and plant species.
4. Do not store building materials closer to trees and shrubs to remain than the farthest extension of limbs.

D. Stripping Topsoil: Unless otherwise indicated on the drawings, extend limits of earthwork operations anywhere the existing grade is filled or cut or where construction operations have compacted or otherwise disturbed the existing grade or turf. Strip topsoil as defined herein, or as indicated in the geotechnical report, within the limits of earthwork operations as specified above, unless specifically indicated or specified elsewhere in the specifications or shown on the drawings. Stockpile topsoil and protect as directed by the Architect. Eliminate foreign material larger than 0.014 cubic meters (1/2 cubic foot) in volume, from soil when stockpiled. Retain topsoil on station. Remove foreign materials larger than 50 mm (2 inches) in any dimension from topsoil used in final grading. Do not excavate wet topsoil.

E. Concrete Slabs and Paving:
1. Score deeply or saw cut existing concrete slabs and paving to be removed in a neat, straight cut, sections where excavation or trenching occurs.
2. Extend pavement section, minimum of 300 mm (12 inches) on both sides of widest part of trench excavation. Provide parallel final score lines unless otherwise indicated on Drawings.
3. Remove material from the Cemetery Property.

F. Disposal:
1. Remove materials from site and dispose of at legally approved site.
2. Comply with applicable Federal, State and local regulations. Do not burn materials on site.

3.2 EXCAVATION

A. Shoring, Sheeting and Bracing: Shore, brace, or slope to an angle of repose banks of excavations to protect workmen, banks, adjacent paving, structures, and utilities, in compliance with OSHA requirements.

1. Extend shoring and bracing to bottom of the excavation. Shore excavations carried below the elevations of adjacent existing foundations.

B. Excavation Drainage:
1. Operate pumping equipment, and install other materials, means and equipment to keep excavations free from water and subgrades dry, firm, and undisturbed until permanent work is received by Architect/Engineer.
2. Obtain approval from Architect/Engineer before placement of permanent work on subgrades.
3. Remove disturbed material to firm undisturbed material after water is brought under control, when subgrade for foundations is disturbed by water. Replace disturbed subgrade in trenches by mechanically tamped sand or gravel. When removed disturbed material is located where it is not possible to install and properly compact disturbed subgrade material with mechanically compacted sand or gravel, coordinate with Architect/Engineer to consider use of flowable fill.

C. Blasting: Blasting is permitted only when authorized by Architect/Engineer according to applicable provisions of 29 CFR 1926.

D. Building Earthwork:
1. Excavate foundation excavations to solid undisturbed subgrade.
2. Remove loose or soft material to solid bottom.
3. Fill excess cut under footings or foundations with 25 MPa (3000 psi) concrete, poured separately from the footings.
4. Do not tamp earth for backfilling in footing bottoms.

E. Trench Earthwork:
1. Utility Trenches (Except Sanitary and Storm Sewer):
   a. Excavate to width required for sheeting and bracing and proper performance of Work.
   b. Grade bottom of trenches with bell-holes, scooped-out to provide uniform bearing.
   c. Support piping on undisturbed earth unless a mechanical support is indicated on Drawings.
   d. The length of open trench in advance of pipe laying shall not be greater than is authorized by the Architect/Engineer.
2. Sanitary and storm sewer trenches:
   a. Trench Width:
      1) Below Point 150 mm (6 inches) Above Top of Pipe:
         a) Pipe up to 300 mm (12 inches): 600 mm (24 inches) diameter.
         b) Pipe Larger than 300 mm (l2 inches): 4/3 diameter of pipe plus 200 mm (8 inches).
      2) Trench Width Above 150 mm (6 inches): Pipe size as required for sheeting and bracing and proper performance of the Work.
   b. Bed Bottom Quadrant of Pipe:
      1) Undisturbed Soil: Bell holes no larger than necessary for jointing. Backfill with clean earth placed and tamped by hand, maximum 300 mm (12 inches) above top of pipe.
      2) Granular Fill: Depth of fill minimum 75 mm (3 inches) plus one-sixth of pipe diameter below the pipe of 300 mm (12 inches) above top of pipe. Place and tamp fill material by hand.
   c. Place and compact excess backfill using acceptable excavated materials. Do not use unsuitable materials.
   d. Use granular fill for bedding where rock or rocky materials are excavated.

F. Site Earthwork:
1. Perform excavation as indicated on Drawings and as follows:
   a. Remove and replace unsuitable subgrade materials, as determined by the Architect/Engineer.

b. Obtain material samples for soil classification, under Architect/Engineer's direction, for testing by an approved testing laboratory to determine suitability.
c. When unsuitable material is encountered Contractor to inform Architect & Owner. Contractor to provide estimate for work necessary to correct the issue.

2. Finished subgrade elevation as follows:
a. Pavement Areas: Bottom of pavement or base course as applicable.
b. Planting and Lawn Areas: 100 mm (4 inches) below finished grade, unless otherwise specified or indicated on the Drawings.

3.3 FILLING AND BACKFILLING

A. General: Fill or backfill when all debris, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation. Proof-roll exposed subgrades with a fully loaded dump truck. Use excavated materials or borrow for fill and backfill, as applicable. Do not use unsuitable excavated materials. Do not backfill until foundation walls have been completed above grade and adequately braced, waterproofing or dampproofing applied, and pipes in contact with backfill have been installed, and work inspected and approved by Architect/Engineer.

B. Proof rolling Existing Subgrade: Proof roll with fully loaded dump truck. Make a minimum of one pass in each direction. Remove unstable uncompactable material and replace with granular fill material completed to mix requirements specified.

C. Placing: Place material in horizontal layers not exceeding 200 mm (8 inches) loose depth and then compacted. Do not place material muddy, frozen, or with frost surfaces.

D. Compaction: Use approved equipment (hand or mechanical) to suit type of material compacted. Do not operate mechanized vibratory compaction equipment within 3000 mm (10 feet) of new or existing building walls without prior approval of the Architect/Engineer. Moisten or aerate material necessary to provide moisture content that will readily facilitate obtaining specified compaction with equipment used. Compact each layer to minimum 95 percent of maximum density determined according to the following test method ASTM D1557.

3.4 GRADING

A. General: Uniformly grade areas within limits specified, including adjacent transition areas. Smooth finished surface within specified tolerance. Provide uniform levels or slopes between points where elevations are indicated, or between points and existing finished grades. Provide smooth transition between abrupt changes in slope.

B. Cut rough or sloping rock to level beds for foundations. In unfinished areas, fill low spots and level off with coarse sand or fine gravel.

C. Slope backfill outside the building away from building walls with minimum distance of 1800 mm (6 feet).

D. Finished grade 150 mm (6 inches) below bottom line of windows or other building wall openings unless greater depth is shown.

E. Place crushed stone or gravel fill under concrete slabs on grade, tamped, and leveled, 150 mm (6 inches) thick, unless otherwise indicated on Drawings.

F. Finish subgrade in condition acceptable to the Architect/Engineer at least one day in advance of paving operations. Maintain finished subgrade in a smooth and compacted condition until succeeding operation has been accomplished. Scarify, compact, and grade subgrade before further construction when approved compacted subgrade is disturbed by subsequent operations or adverse weather.

G. Tolerances:

1. Subgrade and Base Course Final Grades for Paved Areas: Plus or minus 6 mm (0.25 inches) of indicated grades.

3.5 LAWN AREAS

A. General: Harrow and till new or existing lawn areas to remain, 100 mm (4 inches) deep. Establish existing or design grades by dragging or similar operations. Do not do earthwork on wet soil. Obtain plant bed approval from Architect/Engineer before seeding or sodding operation begins.

B. Finished Grading: Begin after rough grading has settled. Scarify subgrade surface areas 100 mm (4 inches) deep. Apply topsoil smooth, even surface, and true grades minimum 100 mm (4 inches). Shape top and bottom of banks to form reverse curves in section; make junctions with undisturbed areas to conform to existing topography.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.

2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.

3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.

3.7 DISPOSAL OF UNSUITABLE AND EXCESS EXCAVATED MATERIAL

A. Disposal: Transport surplus satisfactory soil to designated storage areas on Cemetery property. Stockpile or spread soil as directed by Architect/Engineer.
   1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose off Cemetery property.

3.8 CLEANING

A. Upon completion of earthwork operations, clean areas within contract limits, remove tools, and equipment. Clean site, free of debris, and suitable for subsequent construction operations. Remove debris, rubbish, and excess material from the Cemetery Property.

END OF SECTION

SECTION 31 23 19
DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Implementation of Erosion and Sedimentation Control Plan.
   2. Dewater excavations, including seepage and precipitation.

B. Provide all labor, materials, tools, equipment, power, and services necessary for care of water and erosion control. Begin excavation work before the approved Erosion and Sedimentation Control Plan is in place.

1.2 RELATED REQUIREMENTS

A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.

B. Safety Requirements: Section 00 72 00, GENERAL CONDITIONS, Article, ACCIDENT PREVENTION.

C. Submittal requirements as specified in Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

D. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.

E. Subsurface Investigation: Section 01 00 00, GENERAL REQUIREMENTS, Article 1.11, PHYSICAL DATA.

F. Erosion Control: Section 01 57 23, TEMPORARY STORM WATER POLLUTION CONTROLS.

1.3 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
   1. Show drawings and data with method employed in dewatering excavated areas, 30 days before commencement of excavation.
   2. Show location, depth and size of wellpoints, headers, sumps, ditches, size and location of discharge lines, capacities of pumps and standby units, and detailed description of dewatering methods to be employed to convey water from site to adequate disposal. Show details of the dewatering facilities, including equipment and erosion protection. Include facilities and procedures for insuring discharge water quality according to the applicable provisions of Erosion Control Plan or SWPPP or NPDES requirements, Section 01 57 23, TEMPORARY STORM WATER POLLUTION CONTROLS.
   3. Include written report outlining control procedures to be adopted when a dewatering problem arises.
   4. Submit materials in format acceptable to all regulatory agencies.

C. Inspection Reports.

D. All required permits.

E. Delegated Design Drawings and Calculations: Signed and sealed by responsible design professional.

1. Identify deviations from details shown on drawings.

1.4 QUALITY ASSURANCE

A. Permitting Requirements: Comply and obtain required Federal, State, and County permits where Work is performed.

B. Comply and provide information to Contracting Officer's Representative (COR), all conditions of regulating permits. Obtain written approval from COR before discontinuing operation of dewatering system.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Dewatering: Lower and control ground water table levels and hydrostatic pressures and control surface water.

2.2 SYSTEM PERFORMANCE

A. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in state where work is located.

1. Minor deviations to details shown on drawings to accommodate manufacturer’s standard products may be accepted by COR when deviations do not affect design concept and specified performance.

B. Design dewatering system complying with specified performance:

1. Size and Capacity: At least 300 mm (1 foot) below lowest foundation subgrade or bottom of pipe trench.
2. Reduce hydrostatic head below excavation surface minimum 300 mm (1 foot) until backfill has been completed at least 300 mm (1-foot) above the initial observed groundwater level.
3. Prevent loss of fines, seepage, boils, quick conditions or softening of foundation strata.
4. Maintain stability of sides and bottom of excavation.
5. Construction operations are performed in the dry subgrade.
6. Control of surface and subsurface water as part of dewatering requirements. Maintain adequate control.
    a. Stabilize excavated and constructed slopes not adversely affected by saturated soil.
    b. Control erosion.
    c. Flooding of excavations or damage to structures does not occur.
    d. Surface water drains away from excavations.
    e. Protect excavations from becoming wet from surface water before additional work is undertaken.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install dewatering system to lower and control ground surface water to permit excavation, construction of structure, and placement of backfill materials in dry conditions. Make dewatering system adequate to pre-drain the water-bearing strata above and below bottom of structure foundations, utilities and other excavations.

B. Reduce hydrostatic pressure head in water-bearing strata below structure foundations, utility lines, and other excavations, minimum 300 mm (1 foot) below prevailing excavation surface.

C. Operation:

1. Place dewatering system in operation before excavation below ground water table. Operate system continuously 24 hours a day, 7 days a week until construction work below existing ground water level is complete.
2. Place adequate weight of backfill material to prevent buoyancy before discontinuing operation of the system.

D. Water Disposal:

E. Dispose water removed from excavations in such a manner as:

a. Avoid endangering portions of work under construction or completed.
b. Avoid inconvenience to Government or to others working near site.
c. Comply with permit regulations for disposal of water.
d. Control Runoff: Control runoff in work areas including but not limited to excavations, access roads, parking areas, laydown, and staging areas. Provide, operate, and maintain all ditches, basins, sumps, culverts, site grading, and pumping facilities to divert, collect, and remove all water from the work areas. Remove water from work areas and dispose according to applicable permits.

2. Excavation Dewatering:

a. Divert, collect, control, and remove water from construction work areas and excavations.
b. Arrange drainage features and alter as required to avoid degradation of the final excavated surfaces.
c. Utilize all necessary erosion and sediment control measures to avoid construction related degradation of natural water quality.

3. Remove and dispose surface and ground water entering excavations, trenches, and work areas during construction. Keep excavation dry during subgrade preparation and until construction is complete and pipe is installed to avoid damage from hydrostatic pressure, flotation, or other cause will result.

F. Standby Equipment:

1. Install complete standby equipment for immediate operation, as required to maintain de-watering on a continuous basis and in the event that all or any part of the system become inadequate or fail.

G. Corrective Action:

1. Perform work necessary to restore foundation soil and damaged structure resulting from failure of dewatering system.

H. Damages:

1. Immediately repair damages to adjacent facilities caused by dewatering operations.

END OF SECTION

DIVISION 32 – EXTERIOR

SECTION 32 05 23 – CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Site work concrete.
   2. Combination curb and gutter.

1.2 RELATED REQUIREMENTS

A. Laboratory and Field Testing Requirements: Section 01 40 00, Quality Requirements.

B. Subgrade Preparation: Section 31 20 11, Earth Moving.

C. Concrete Materials, Quality, Mixing, Design and Other Requirements: Section 03 30 53, Cast-In-Place Concrete.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):
   1. C94/C94M-16 - Ready-Mixed Concrete.
   2. C143/C143M-15a - Slump of Hydraulic Cement Concrete.
   3. C1116/C1116M-10a(2015) - Fiber-Reinforced Concrete.
   4. D5893/D5893M-10 - Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.
   5. D6690-15 - Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

1.4 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.
   1. Required Participants:
      a. Architect/Engineer.
      b. Contractor.
      c. GVMC Director.

1.5 SUBMITTALS

A. Submittal Procedures: Section 01 33 00, Submittals.

B. Submittal Drawings:
   1. Show size, configuration, and fabrication and installation details.
   2. Show reinforcing.
   3. Include jointing plan for concrete pavements, curbs and gutters.

C. Manufacturer's Literature and Data:
   1. Description of each product.
      a. Expansion joint filler.
      b. Hot poured sealing compound.
      c. Reinforcement.
      d. Curing materials.
   2. Installation instructions.

D. Test Reports: Certify products comply with specifications.
   1. Job-mix formula.
   2. Select subbase materials.

E. Certificates: Certify products comply with specifications.
   1. Expansion joint filler.
   2. Reinforcement.
   3. Curing materials.
   4. Concrete protective coating.

F. Qualifications: Substantiate qualifications comply with specifications.
   1. Installer with project experience list.
   2. Land surveyor.

G. Concrete mix design.

H. Select subbase job-mix design: Report the following:
   1. Material sources.
   2. Gradation.
   3. Plasticity index.
   4. Liquid limit.
   5. Laboratory compaction curves indicating maximum density at optimum moisture content.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Regularly installs specified products.
   2. Installed specified products with satisfactory service on five similar installations.
      a. Project Experience List: Provide contact names and addresses for completed projects.

B. Land Surveyor: Professional land surveyor or engineer registered to provide land surveys in jurisdiction where project is located.

C. Preconstruction Testing:
   1. Engage independent testing laboratory to perform tests and submit reports.
      a. Deliver samples to laboratory in number and quantity required for testing.
   2. Concrete mix design.

1.7 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, and manufacture date.

C. Deliver steel reinforcement to prevent damage.

D. Before installation, return or dispose of products with damaged or opened packaging and distorted or damaged steel reinforcement.

E. Bulk Products: Deliver bulk products away from buildings, utilities, pavement, and existing turf and planted areas. Maintain dry bulk product storage away from contaminants.

1.8 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight facility.

B. Protect products from damage during handling and construction operations.

1.9 FIELD CONDITIONS

A. Place concrete as specified under Article 3.4 E., for Cold Weather Placement and Article 3.4 D., for Hot Weather Placement of Section 03 30 53, Cast-In-Place Concrete.

1.10 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 CONCRETE

A. Concrete: Type C, air-entrained as specified in Section 03 30 53, Cast-In-Place Concrete, except as follows:

TYPE	MAXIMUM SLUMP*
Curb & Gutter	75 mm (3 inches)
* For concrete to be vibrated: Slump as determined by ASTM C143/C143M. Tolerances as established by ASTM C94/C94M.	

2.2 REINFORCEMENT

A. Steel Reinforcement: Type, amount, and locations as shown on drawings and as specified.

B. Welded Wire-Fabric: AASHTO M55M/M55.

C. Fiber Reinforcement: Polypropylene fibers designed for use in concrete pavement, complying with ASTM C1116/C116M, Type III, 13 to 38 mm (1/2 to 1 1/2 inches) long. Include 2.27 kg (5 lbs.) per.76 cu. m (1 cu. yd.) of concrete in batch.

2.3 FORMS

A. Forms: Metal or wood, straight and suitable in cross-section, depth, and strength to resist springing during depositing and consolidating of concrete.

B. Tolerance: 3 mm (1/8 inch) maximum variation from straight line in any 3000 mm (10 foot) long section, in either a horizontal or vertical direction.

C. Wood Forms: Minimum 50 mm (2 inches) thick (nominal), free from warp, twist, loose knots, splits, or other defects. Provide approved flexible or curved forms for forming radii.

2.4 CONCRETE CURING MATERIALS

A. Concrete Curing Materials: Comply with one of the following:
   1. Burlap: AASHTO M182, weighing 233 g/sq. m (7 oz./sq. yd.) dry.
   2. Impervious Sheeting: AASHTO M171.
      a. Polyethylene: Minimum 0.1 mm (4 mils) thick.
   3. Liquid Membrane Curing Compound: AASHTO M148 Type 1 without paraffin or petroleum.

2.5 EXPANSION JOINT FILLERS

A. Expansion Joint Filler: AASHTO M213.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

C. Prepare, construct, and finish subgrade as specified in Section 31 20 11, Earth Moving.

D. Maintain subgrade in smooth, compacted condition, complying with required section and established grade until succeeding operation has been accomplished.

3.2 SETTING FORMS

A. Form Substrate:
1. Compact form substrate to uniformly support forms along entire length at grade as shown on drawings.
2. Correct substrate imperfections or variations by cutting or filling and compacting.

B. Form Setting:
1. Set forms sufficiently in advance of concrete placement to permit performance and approval of operations required with and adjacent to form lines.
2. Set forms to indicated line and grade and use stakes, clamps, spreaders, and braces to prevent movement in any direction.
3. Tolerances: Conform to line and grade with 3 mm (1/8 inch) tolerance when checked with straightedge, with maximum 6 mm (1/4 inch) deviation from true line at any point.
4. Remove forms when removal will not damage concrete and when required for finishing.
5. Clean and oil forms before each use.

C. Land Surveyor: Establish and control alignment and form grade elevations or concrete slipforming machine operations.
1. Make necessary corrections to forms immediately before placing concrete.
2. When any form has been disturbed or any subgrade or subbase has become unstable, reset and recheck form before placing concrete.

3.3 PLACING REINFORCEMENT

A. Keep reinforcement free of dirt, oil, rust, scale or other substances preventing concrete bond.

B. Install reinforcement as shown on drawings.

C. Support and securely tie reinforcing steel to prevent displacement during concrete placement.

D. Obtain Architect/Engineer's approval of reinforcement placement before placing concrete.

E. Synthetic Fiber in Flatwork: Uniformly disperse in concrete mixture at 3 kg/cu. m (5 lbs./cu. yd.) minimum rate.

3.4 PLACING CONCRETE – GENERAL

A. Preparation:
1. Obtain Architect/Engineer's approval.
2. Remove debris and other foreign material from between forms.
3. Uniformly moisten subgrade, base, or subbase without standing water.

B. Convey concrete from mixer to final location without segregation or loss of ingredients. Deposit concrete to minimize handling.

C. During placement, consolidate concrete by spading or vibrating to minimize voids, honeycomb, and rock pockets.
1. Vibrate concrete against forms and along joints.
2. Avoid excess vibration and handling causing segregation.

D. Place concrete continuously between joints without bulkheads.

E. Install construction joint whenever concrete placement is suspended for more than 30 minutes and at end of each day's work.

F. Workmen or construction equipment coated with foreign material will not be permitted to walk or operate in concrete during placement and finishing operations.

3.5 PLACING CONCRETE FOR CURB AND GUTTER

A. Place concrete in one layer conforming to cross section shown on drawings after consolidating and finishing.

B. Deposit concrete near joints without disturbing joints. Do not place concrete directly onto joint assemblies.

C. After concrete has been placed in forms, use a strike-off guided by side forms to bring surface to proper section to be compacted.

D. Consolidate concrete thoroughly by tamping and spading, or with approved mechanical finishing equipment.

E. Finish concrete surface to grade with wood or metal float.

F. Construct concrete pads and pavements with sufficient slope to drain, preventing standing water.

3.6 CONCRETE FINISHING – GENERAL

A. Follow operation sequence below, unless otherwise indicated on drawings:
1. Consolidating, floating, straight-edging, troweling, texturing, and joint edging.
2. Maintain finishing equipment and tools in clean and approved condition.

3.7 CONCRETE FINISHING - CURB AND GUTTER

A. Gutter and Curb Top:
1. Round edges of gutter and curb top with edging tool to 6mm (1/4 inch) radius or as otherwise shown on drawings.
2. Float surfaces and finish with smooth wood or metal float until true to grade and section and uniform texture.
3. Finish surfaces longitudinally, while still wet, with bristle type brush.

B. Curb Face:
1. Remove curb form and immediately rub curb face with wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed.
2. Brush curb face, while still wet, to match gutter and curb top.

C. Tolerances: Except at grade changes or curves, when tested with 3000 mm (10 foot) straightedge.
1. Variation from Indicated Plane and Grade:
a. Gutter: Maximum 3 mm (1/8 inch).
b. Curb Top and Face: Maximum 6 mm (1/4 inch).

D. Replace curbs and gutters within joint boundary when curbs and gutters exceed specified tolerances.

E. Correct depressions causing standing water.

F. Visible surfaces and edges of finished curb and gutter to be free of blemishes, form marks, and tool marks, and uniform in color, shape, and appearance.

3.8 JOINTS – GENERAL

A. Place joints, where shown on drawings.
   1. Conform to details shown.
   2. Install joints perpendicular to finished concrete surface.

B. Make joints straight and continuous from edge to edge of pavement.

3.9 CONTRACTION JOINTS

A. Cut joints to depth as shown with grooving tool or jointer of radius as shown on drawings or by sawing with blade to produce required width and depth.

B. Construct joints in curbs and gutters by inserting 3 mm (1/8 inch) steel plates conforming to curb and gutter cross sections.
   1. Keep plates in place until concrete can hold its shape.

C. Finish joint edges with edging tool having radius as shown on drawings.

D. Score pedestrian pavement with standard grooving tool or jointer.

3.10 EXPANSION JOINTS

A. Form expansion joints with preformed expansion joint filler material of thickness shown on drawings.
   1. Without dowels, locate joints around perimeter of structures and features abutting site work concrete.
   2. Create complete, uniform separation between structure and site work concrete.

B. Extend expansion joint material full depth of concrete with top edge of joint filler below finished concrete surface where sealant is indicated on drawings.

C. Cut and shape material matching cross section.

D. Anchor with approved devices to prevent displacing during placing and finishing operations.

E. Round the edges of joints with an edging tool.

3.11 CONSTRUCTION JOINTS

A. Locate longitudinal and transverse construction joints between slabs of vehicular pavement as shown on drawings.

B. Place transverse construction joints of type shown, where indicated, and whenever concrete placement is suspended for more than 30 minutes.

C. Provide butt-type joint with dowels in curb and gutter if joint occurs at planned joint location.

D. Provide keyed joints with tie bars if joint occurs in middle third of typical curb and gutter joint interval.

3.12 FORM REMOVAL

A. Keep forms in place minimum 12 hours after concrete placement. Remove forms without damaging concrete.

B. Do not use bars or heavy tools against concrete to remove forms. Promptly repair damaged concrete found after form removal.

3.13 CONCRETE

A. Concrete Protection:
   1. Protect unhardened concrete from rain and flowing water.
   2. Ensure sufficient curing and protection materials are available and ready for use before concrete placement begins.
   3. Protect concrete to prevent pavement cracking from ambient temperature changes during curing period.
      a. Replace pavement damaged by curing method allowing concrete cracking.
      b. Employ another curing method as directed by Architect/Engineer.

B. Cure concrete for minimum 7 days by one of the following methods appropriate to weather conditions preventing moisture loss and rapid temperature change:
   1. Burlap Mat: Provide minimum two layers kept saturated with water during curing period. Overlap mats minimum 150 mm (6 inches).
   2. Impervious Sheeting: Provide waterproof paper, polyethylene-coated burlap, or polyethylene sheeting.
      a. Wet exposed concrete surface with fine water spray and cover with sheet materials.
      b. Overlap sheets minimum 300 mm (12 inches).
      c. Securely anchor sheet materials preventing displacement.

C. Liquid Membrane Curing Compound:
   1. Protect joints indicated to receive sealants preventing contamination from curing compound.
   2. Insert moistened paper or fiber rope into joint or cover joint with waterproof paper.
   3. Apply curing compound before concrete dries.
   4. Apply curing compound in two coats at right angles to each other.
   5. Application Rate: Maximum 5 sq. m/L (200 sq. ft./gal.), both coats.
   6. Immediately reapply curing compound to surfaces damaged during curing period.

3.14 FIELD QUALITY CONTROL

A. Field Tests: Performed by testing laboratory specified in Section 01 40 00, Submittals.
   1. Concrete: Testing specified in Section 03 30 53 Cast-In-Place Concrete.
      a. Delivery samples.
      b. Field samples.
   2. Slip Resistance: Steps and pedestrian paving.

3.15 CLEANING

A. After completing curing:
   1. Remove curing material, except liquid membrane.
   2. Sweep the concrete clean.
   3. Seal all joints after removing foreign matter from joint.
   4. Clean concrete of debris and construction equipment as soon as curing and joint sealing have been completed.

B. Remove and legally dispose of debris, rubbish, and excess material from project site.

3.16 PROTECTION

A. Protect exterior improvements from traffic and construction operations.
   1. Prohibit traffic on paving for minimum seven days after placement, or longer as directed by Architect/Engineer.

B. Remove protective materials immediately before acceptance.

C. Repair damage.
1. When directed by Architect/Engineer, replace concrete containing cracking, fractures, spalling, and other defects within joint boundary, at no additional cost to Government.

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS
SECTION 32 08 00 – COMMISSIONING OF PLANTING IRRIGATION SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

A. The requirements of this Section apply to all sections of Division 32.

1.2 RELATED WORK

A. Section 01 33 00 “Submittals”.

1.3 SUMMARY

A. This Section includes requirements for commissioning the Facility site utilities systems, related subsystems and related equipment.

B. Refer to Section 01 40 00 “Quality Requirements” for more details regarding processes and procedures as well as roles and responsibilities for all Commissioning Team members.

1.4 COMMISSIONED SYSTEMS

A. Commissioning of a system or systems specified in Division 32 is part of the construction process. Documentation and testing of these systems, as well as training of the VA’s Operation and Maintenance personnel in accordance with the requirements of Section 01 77 00 “Closeout Procedures” and of Division 32, is required in cooperation with the VA and the Commissioning Agent.

B. The Facility site utilities systems commissioning will include the systems listed in Division 33.

1.5 SUBMITTALS

A. The commissioning process requires review of selected Submittals that pertain to the systems to be commissioned. The Commissioning Agent will provide a list of submittals that will be reviewed by the Commissioning Agent. This list will be reviewed and approved by the VA prior to forwarding to the Contractor. Refer to Section 01 33 00 “Submittals” for further details.

B. The commissioning process requires Submittal review simultaneously with engineering review. Specific submittal requirements related to the commissioning process are specified in Section 01 77 00 “Closeout Procedures”.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 CONSTRUCTION INSPECTIONS

A. Commissioning of Site Utility systems will require inspection of individual elements of the site utility systems construction throughout the construction period. The Contractor shall coordinate with the Commissioning Agent in accordance with Section 01 77 00 “Closeout Procedures” and the Commissioning plan to schedule site utility systems inspections as required to support the Commissioning Process.

3.2 PRE-FUNCTIONAL CHECKLISTS

A. The Contractor shall complete Pre-Functional Checklists to verify systems, subsystems, and equipment installation is complete and systems are ready for Systems Functional Performance Testing. The Commissioning Agent will prepare Pre-Functional Checklists to be used to document equipment installation. The Contractor shall complete the checklists. Completed

checklists shall be submitted to the VA and to the Commissioning Agent for review. The Commissioning Agent may spot check a sample of completed checklists. If the Commissioning Agent determines that the information provided on the checklist is not accurate, the Commissioning Agent will return the marked-up checklist to the Contractor for correction and resubmission. If the Commissioning Agent determines that a significant number of completed checklists for similar equipment are not accurate, the Commissioning Agent will select a broader sample of checklists for review. If the Commissioning Agent determines that a significant number of the broader sample of checklists is also inaccurate, all the checklists for the type of equipment will be returned to the Contractor for correction and resubmission. Refer to Section 01 77 00 "Closeout Procedures" for submittal requirements for Pre-Functional Checklists, Equipment Startup Reports, and other commissioning documents.

3.3 CONTRACTORS TESTS

A. Contractor tests as required by other sections of Division 32 shall be scheduled and documented in accordance with Section 01 77 00 "Closeout Procedures". All testing shall be incorporated into the project schedule. Contractor shall provide no less than 7 calendar days' notice of testing. The Commissioning Agent will witness selected Contractor tests at the sole discretion of the Commissioning Agent. Contractor tests shall be completed prior to scheduling Systems Functional Performance Testing.

3.4 SYSTEMS FUNCTIONAL PERFORMANCE TESTING

A. The Commissioning Process includes Systems Functional Performance Testing that is intended to test systems functional performance under steady state conditions, to test system reaction to changes in operating conditions, and system performance under emergency conditions. The Commissioning Agent will prepare detailed Systems Functional Performance Test procedures for review and approval by the Resident Engineer. The Contractor shall review and comment on the tests prior to approval. The Contractor shall provide the required labor, materials, and test equipment identified in the test procedure to perform the tests. The Commissioning Agent will witness and document the testing. The Contractor shall sign the test reports to verify tests were performed.

3.5 TRAINING OF VA PERSONNEL

A. Training of the VA operation and maintenance personnel is required in cooperation with the Resident Engineer and Commissioning Agent. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. Contractor shall submit training agendas and trainer resumes in accordance with the requirements of Section 01 77 00 "Closeout Procedures". The instruction shall be scheduled in coordination with the VA Resident Engineer after submission and approval of formal training plans

END OF SECTION

DIVISION 32 – EXTERIOR
SECTION 32 12 16 – ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Composition, mixing, and construction on prepared subgrade and protection of hot asphalt concrete pavement.

1.2 APPLICABLE PUBLICATIONS

A. Comply with references to the extent specified in this section.

B. American Association of State Highway and Transportation Officials (AASHTO):
   1. 2016 - Standard Specifications for Transportation Materials and Methods of Sampling and Testing, and AASHTO Provisional Standards.
   2. M320-10 - Performance-Graded Asphalt Binder.
   3. T283-14 - Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage.

C. Asphalt Institute:
   1. Specification SS2.

D. ASTM International (ASTM):
   1. C29/C29M-16 - Bulk Density ("Unit Weight") and Voids in Aggregate.
   2. C977-10 - Quicklime and Hydrated Lime for Soil Stabilization.
   3. D6390-11 - Draindown Characteristics in Uncompacted Asphalt Mixtures.

1.3 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.
   1. Required Participants:
      a. Architect/Engineer.
      b. Contractor.
      c. Installer.
      d. GVMC Director.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 00, Submittals.

B. Test Reports: Certify products comply with specifications.
   1. Aggregate Base Course.
   2. Porous Asphalt and Asphalt Base/Surface Course.
   3. Job-mix formula.

C. Certificates: Certify products comply with specifications.
   1. Asphalt prime and tack coat material complying with State Highway Department requirements.
   2. Asphalt cement complying with State Highway Department requirements.
   3. Job-mix certification that mix equals or exceeds State Highway Specification.

D. Qualifications: Substantiate qualifications comply with specifications.
   1. Manufacturer with project experience list.
   2. Land Surveyor.

E. One copy of State Highway Department Specifications (Latest Edition).

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Regularly manufactures specified products.
   2. Manufactured specified products with satisfactory service on five similar installations for a minimum of five years.
      a. Project Experience List: Provide contact names and addresses for completed projects.

B. Architect/Engineer to have access to all parts of material producing plants to check mixing operations and materials and adequacy of equipment.

C. Land Surveyor: Professional land surveyor or engineer registered to provide land surveys in jurisdiction where project is located.

D. Preconstruction Testing:
   1. Engage independent testing laboratory to perform tests and submit reports.
   2. Asphalt Base Course:
      a. Test sources, gradation, liquid limit, plasticity index, percentage of wear, and other properties required by State Highway Department.
   3. Porous Asphalt and Asphalt Base/Surface Course:
      a. Test aggregate source, gradation, soundness loss, percentage of wear, and other properties required by State Highway Department.
   4. Job Mix Formula:
      a. Test as required by State Highway Department.

1.6 FIELD CONDITIONS

A. Environment:
   1. Do not begin asphaltic concrete material placement when atmospheric temperature is below 10 degrees C (50 degrees F), nor during fog, rain, or other unsuitable conditions.

1.7 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 ASPHALT PAVING AGGREGATES

A. Aggregates: Crushed stone, gravel, sand, or other sound, durable mineral materials processed and blended, and naturally combined.

B. Subbase Aggregate: Maximum 38 mm (1-1/2 inches).

C. Base Aggregate Maximum Size:
   1. Base course over 152 mm (6 inches) thick: 38 mm (1-1/2 inches).
   2. Other base courses: 19 mm (3/4 inch).

D. Asphaltic Base Course:
   1. Maximum Particle Size: 25 mm (1 inch).
   2. In conflicts between this specification and requirements in latest version of State Highway Specifications, State Specifications take precedence.

E. Aggregates for Asphaltic Concrete Paving: Mixture of sand, mineral aggregate, and liquid asphalt in proportions with percentage by weight within the following:

Sieve Sizes	Percentage Passing

Sieve Sizes	Percentage Passing
19 mm(3/4 inch)	100
9.5 mm(3/8 inch)	67 to 85
6.4 mm(1/4 inch)	50 to 65
2.4 mm(No. 8 mesh)	37 to 50
600 µm(No. 30 mesh)	15 to 25
75 µm(No. 200 mesh)	3 to 8

1. Plus 50/60 penetration liquid asphalt at 5 percent to 6-1/2 percent of combined dry aggregates.

2.2 ASPHALTS

A. Comply with Asphalt Institute Specification SS2:
   1. Asphalt cement: Penetration grade 50/60.
   2. Prime coat: Cut-back type, grade MC-250.
   3. Tack coat: Uniformly emulsified, grade SS-1H.

PART 3 - EXECUTION

3.1 PREPARATION

A. Land Surveyor to establish and control pavement (aggregate or asphalt base course and asphalt surface course) alignments, grades, elevations, and cross sections as shown on Drawings.

3.2 MIXING ASPHALTIC CONCRETE MATERIALS

A. Provide hot plant-mixed asphaltic concrete paving materials.
   1. Temperature leaving plant: 143 degrees C (290 degrees F) minimum, 160 degrees C (320 degrees F) maximum.
   2. Temperature at time of placing: 138 degrees C (280 degrees F) minimum.

3.3 SUBGRADE

A. Shape to line and grade and compact with self-propelled rollers.

B. Fill depressions developed under rolling with acceptable material and re-roll area.

C. Remove soft areas, fill with acceptable materials and re-roll area.

D. If subgrade becomes rutted or displaced before the placing of subbase, rework subgrade to bring to line and grade.

E. Proof-roll subgrade with maximum 45 tonne (50 ton) gross weight dump truck as directed by Architect/Engineer. If pumping, pushing, or other movement is observed, rework area to provide stable and compacted subgrade.

F. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rate and written instructions. Apply to dry subgrade of surface of compacted aggregate base before applying paving materials.

3.4 BASE COURSES

A. Base:
   1. Spread and compact to thickness shown on Drawings.
   2. Begin rolling sides, continue toward center, and continue until there is no movement ahead of roller.
   3. After completion of base rolling, no hauling is permitted over base except top course material delivery.

B. Thickness Tolerance: Compacted thicknesses shown on Drawings within minus 0.0 mm (0.0 inches) to plus 12.7 mm (0.5 inch).

C. Smoothness Tolerance: Lines and grades shown on Drawings within 5 mm in 3 m (3/16 inch in 10 feet).

D. Moisture Content: Only amount required to achieve specified compaction.

3.5 ASPHALTIC CONCRETE PAVING PLACEMENT

A. Remove all loose materials from compacted base.

B. Apply prime coat, and tack coat where required, and allow to dry according to manufacturer's instructions as approved by Architect.

C. Receipt of Asphaltic Concrete Materials:
1. Do not accept material unless covered with tarpaulin until unloaded, and unless material is minimum 130 degrees C (280 degrees F).
2. Do not begin asphaltic concrete material placement when atmospheric temperature is below 10 degrees C (50 degrees F), nor during fog, rain, or other unsuitable conditions.

D. Spreading:
1. Spread material with minimal handling.
2. For finished paving 76 mm (3 inches) or less, spread in one layer.

E. Rolling:
1. After material has been spread to proper depth, roll until surface is hard, smooth, unyielding, and true to thickness and elevations shown on drawings.
2. Roll in minimum two directions until no roller marks are visible.
3. Finished paving smoothness tolerance:
   a. No depressions which will retain standing water.
   b. Maximum deviation: 3 mm in 1.8 m (1/8 inch in 6 feet).

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections 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 specified requirements.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.

2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

   a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
   Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.7 CLEANING

A. Remove debris, rubbish, and excess material from project site.

3.8 PROTECTION

A. Protect asphaltic concrete paved areas from traffic until sealer is set and cured and does not pick up under foot or wheeled traffic.

B. Repair damage.

END OF SECTION

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Paint on pavement surfaces, in form of traffic lanes, parking bays, areas restricted to handicapped persons, crosswalks, and other detail pavement markings.

1.2 RELATED REQUIREMENTS

A. Paint VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.

B. Paint Color: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. Federal Specifications (Fed. Spec.):

1. TT-B-1325D - Beads (Glass Spheres) Retro-Reflective.
2. TT-P-1952F - Paint, Traffic and Airfield Marking, Waterborne.

C. Master Painters Institute (MPI):

1. No. 97 - Traffic Marking Paint, Latex.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Show pavement marking configuration and dimensions.
2. Show international symbol of accessibility at designated parking spaces.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Application instructions.

D. Samples:

1. Paint: 200 mm (8 inches) square, each type and color.

E. Certificates: Certify products comply with specifications.

F. Qualifications: Substantiate qualifications comply with specifications.

1. Installer with project experience list.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Regularly installs specified products.

2. Installed specified products with satisfactory service on five similar installations for minimum five years.
    a. Project Experience List: Provide contact names and addresses for completed projects.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight conditioned facility.

B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Environment:
    1. Product Temperature: Minimum 13 degrees C (55 degrees F) for minimum 48 hours before installation.
        a. Surface to be painted and ambient temperature: Minimum 10 degrees C (50 degrees F) and maximum 35 degrees C (95 degrees F).

B. Field Measurements: Verify field conditions affecting traffic marking installation. Show field measurements on Submittal Drawings.

1.9 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design paint complying with specified performance:
    1. Application: Fed. Spec. TT-P-1952.

2.2 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Provide each product from one manufacturer and from one production run.
    1. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
        a. Paints and coatings.

2.3 SANDBLASTING EQUIPMENT

A. Air compressor, hoses, and nozzles of proper size and capacity as required for cleaning painted surfaces. Compressor to provide minimum 0.08 cu. m/s (150 cfm) of air at pressure of minimum 625 kPa (90 psi) at each nozzle used.

2.4 PAINT APPLICATOR

A. Apply marking paint with approved mechanical equipment. Provide equipment with constant agitation of paint and travel at controlled speeds. Synchronize one or more paint "guns" to automatically begin and cut off paint flow in case of skip lines. Equipment to have manual control to apply continuous lines of varying length and marking widths as indicated on Drawings. Provide pneumatic spray guns for hand application of paint in areas where mobile paint applicator cannot be used.

2.5 PAINT

A. Paint: MPI No. 97. For obliterating existing markings comply with Fed. Spec. TT-P-1952. Provide minimum 18 L (5 gallons) containers.

2.6 REFLECTIVE GLASS BEADS

A. NOT APPLICABLE

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
   1. Allow new pavement surfaces to cure for period of minimum 14 days before application of marking materials.
B. Protect existing construction and completed work from damage.
C. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.
   1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or combination of these methods.
   2. Completely remove rubber deposits, existing paint markings, and other coatings adhering to pavement with scrapers, wire brushings, sandblasting, mechanical abrasion, or approved chemicals as directed by Contracting Officer's Representative.
   3. As an option, comply with Fed. Spec. TT-P-1952 for removal of existing paint markings on asphalt pavement. Apply black paint in as many coats as necessary to completely obliterate existing markings.
   4. Scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application, Where oil or grease are present on old pavements to be marked, .
      a. After cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through new paint.

5. Clean and dry surface before pavement marking. Do not begin any marking until Contracting Officer's Representative inspected surface and gives permission to proceed.

3.2 TEMPORARY PAVEMENT MARKING

A. Apply Temporary Pavement Markings of colors, widths and lengths shown on drawings or directed by Contracting Officer's Representative. After temporary marking has served its purpose and when so ordered by Contracting Officer's Representative, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method to prevent damage on applied surface.

B. As an option, provide approved preformed pressure sensitive adhesive tape type of temporary pavement marking of required colors, widths and lengths in lieu of temporary painted marking. Continuous durability and effectiveness of such marking is required during period for which its use is required. Remove any unsatisfactory tape type marking and replace with painted markings.

3.3 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.4 PAINT APPLICATION

A. Apply uniformly painted pavement marking of required colors, length, and width with true, sharp edges and ends on properly cured, prepared, and dried surfaces.

B. Comply with details as indicated on drawings and established control points.

C. Apply paint at wet film thickness of 0.4 mm (0.015 inch). Apply paint in one coat. When directed by Contracting Officer's Representative, apply additional coats at markings showing light spots. Comply with paint manufacturer's maximum drying time requirements to prevent undue softening of asphalt, and pick-up, displacement, or discoloration by tires of traffic.

D. When deficiency in marking drying occurs, discontinue paint operations until cause of slow drying is determined and corrected.

E. Remove and replace marking applied less than minimum material rates, deviates from true alignment, exceeds stipulated length and width tolerances, or shows light spots, smears, or other deficiencies or irregularities.

F. Remove marking by carefully controlled sandblasting, approved grinding equipment, or other approve method to prevent damage on applied surface.

3.5 DETAIL PAVEMENT MARKING APPLICATION

A. Apply Detail Pavement Markings, exclusive of actual traffic lane marking as follows:

1. At exit and entrance islands and turnouts.
2. On curbs.
3. At crosswalks.
4. At parking bays.

5. Other locations as indicated on drawings.

B. Apply International Handicapped Symbol at indicated parking spaces. Color as shown on drawings. Apply paint for symbol using suitable template that will provide pavement marking with true, sharp edges and ends.

C. Install detail pavement markings of colors, widths and lengths, and design pattern at locations indicated on drawings.

3.6 TOLERANCES

A. Length and Width of Lines: Plus or minus 75 mm (3 inches) and plus or minus 3 mm (1/8 inch), respectively, in case of skip markings.

B. Length of intervals exceeding line length tolerance are not acceptable.

3.7 CLEANING

A. Remove excess paint before paint sets.

3.8 PROTECTION

A. Protect pavement markings from traffic and construction operations.

1. Protect newly painted markings from vehicular traffic until paint is dry and track free.
2. Place warning signs at beginning of wet line, and at points well in advance of marking equipment for alerting approaching traffic from both directions.
3. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic.

B. Repair damage.

END OF SECTION

DIVISION 32 – EXTERIOR
SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fence framework, fabric, and accessories; excavation for post bases; concrete foundation for posts, and center drop for gates; and manual gates and related hardware.

1.2 REFERENCES

A. ASTM A121 - Zinc-Coated (Galvanized) Steel Barbed Wire.

B. ASTM A123 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.

C. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

D. ASTM A392 - Zinc-Coated Steel Chain-Link Fence Fabric.

E. ASTM A824 - Metallic Coated Steel Marcelled Tension Wire for Use with Chain Link Fence.

F. ASTM B429 - Aluminum-Alloy Extruded Structural Pipe and Tube.

G. ASTM C94 - Ready-mixed Concrete.

H. ASTM F567 - Practice for Installation of Chain-Link Fence.

I. ASTM F668 - Poly (Vinyl Chloride) (PVC) Coated Steel Chain Link Fence Fabric.

J. ASTM F900 - Industrial and Commercial Swing Gates.

K. ASTM F934 - Standard Colors for Polymer-Coated Chain Link Fence Materials.

L. ASTM F1043 - Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.

M. ASTM F1083 - Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

N. ASTM F1184 - Industrial and Commercial Horizontal Slide Gates.

O. CLFMI (Chain Link Fence Manufacturers Institute) - Product Manual.

1.3 SYSTEM DESCRIPTION

A. Fence Height: as indicated on Drawings.

B. Line Post Spacing: At intervals not exceeding 10 feet.

C. Fence Post and Rail Strength: Conform to ASTM F1043 Heavy Industrial Fence quality.

1.4 SUBMITTALS

A. Section 01 33 00 “Submittals”.

B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.

D. Samples: Submit two samples of fence fabric, illustrating construction and colored finish.

E. Manufacturer's Installation Instructions: Submit installation requirements for fence, and gate posts, fabrics, gates, PVC coatings, and accessories.

1.5 QUALITY ASSURANCE

A. Supply material in accordance with CLFMI - Product Manual.

B. The Architect/Engineer may inspect all fencing materials at the place of manufacture.

C. Perform installation in accordance with ASTM F567.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.

1.7 DELIVERY, STORAGE AND HANDLING

A. Fence fabric and accessories shall be delivered to the construction site in packed cartons or firmly tied rolls.

B. Each package shall be identified and shall bear the manufacturer’s name.

C. Store fence fabric and accessories in a secure and dry place.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. Materials and Components: Conform to CLFMI Product Manual.

B. Fabric Size: CLFMI Heavy Industrial

C. Intermediate Posts: Type I round, II round, C rolled shape.

D. Terminal, Corner, Rail, Brace, and Gate Posts: Type I, II round.

2.2 MATERIALS

A. Framing (Steel): ASTM F1083 Schedule 40 galvanized steel pipe, welded construction, minimum yield strength of 25 ksi; coating conforming to ASTM F1043 Type A on pipe exterior and interior.

B. Framing (Steel): ASTM A569; hot rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 ksi; coating conforming to ASTM F1043 Type B on pipe exterior and interior.

C. Fabric Wire (Steel): ASTM A392 zinc coated wire fabric and ASTM F668 PVC coated.

D. Concrete: Type specified in Section 321313.

2.3 COMPONENTS

A. For fabric height up to 6 feet to 12 feet:

1. Line Posts: 3 inch diameter.
2. Corner, End and Pull Posts: 3 inch diameter.
3. Gate Posts: 3 inch diameter.
4. Top and Brace Rail: 1.66 inch diameter with swedged-end or expansion-type coupling approximately 6 inches long for joining. Attach top rail securely to each gate corner, pull and end post using rail ends or other means.
5. Gate Frame: 1.9 inch diameter for welded fitting and truss rod fabrication.
6. Fabric: 2 inch diamond mesh interwoven wire, 9 guage thick, knuckle end closed, twisted tight, bottom selvage twisted tight.
7. Tension Wire: 0.177 inch thick steel, single strand.
8. Tension Band: 3/16 inch x ¾ inch steel, zinc coated.
9. Tension Strap: 3/16 inch x ¾ inch steel, zinc coated.
10. Tie Wire: Aluminum alloy steel wire, 9 guage.

2.4 ACCESSORIES

A. Caps: Galvanized pressed steel; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; galvanized steel.

C. Gate Hardware: Center gate stop and drop rod, Mechanical keepers; three 180 degree gate hinges, non lift-off type, per leaf and hardware for padlock.

2.5 GATES

A. General
1. Gate types, opening widths and directions of operation shall be as shown on the Drawings.
2. Gates shall conform to the requirements specified for PVC coated steel chain link fence except that PVC coated aluminum alloy framing conforming to ASTM B429 may be used.
3. Gates shall be designed for operation by one person.

B. Swing Gates
1. Swing gates shall be factory assembled, and shall swing 180 degrees.
2. Gates shall conform to ASTM F900 except that framing shall be assembled by welding at the corners. Use of corner fittings shall not be permitted.

2.6 FINISHES

A. Components and Fabric: Galvanized to ASTM A123; ASTM A153 for components; ASTM A392 for fabric; 1.8 oz/sq ft coating.

B. Components and Fabric: Vinyl coating, dark green color in accordance with ASTM F934 over coating of 1.8 oz/sq ft galvanizing.

C. Hardware: Galvanized to ASTM A153, 1.8 oz/sq ft coating.

D. Accessories: Same finish as framing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Place fabric on park side of posts and rails.

C. Set intermediate, terminal, gate, and posts plumb, in concrete footings with top of footing unless otherwise shown on drawing 2 inches above. Slope top of concrete for water runoff.

D. Line Post Footing Depth Below Finish Grade: ASTM F567; if not indicated on drawing, 3 feet minimum.

E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567; if not indicated on drawing, 3 feet minimum.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

G. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

H. Install center and bottom brace rail on corner gate leaves.

I. Do not stretch fabric until concrete foundation has cured 28 days.

J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

K. Position bottom of fabric 2 inches above finished grade.

L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 12 inches on centers.

M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

N. Do not attach the hinged side of gate from building wall; provide gate posts.

O. Install gate with fabric to match fence. Install three hinges per leaf, latch, catches, drop bolt, foot bolts and sockets, retainer and locking clamp.

P. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

Q. Install fence with all posts vertical and all components to the line and grade shown on the Drawings.

R. Excavate holes for posts to the diameter and spacing shown on the Drawings without disturbing the underlying materials.

S. Center and align posts. Place concrete around posts, and vibrate or tamp for consolidation. Recheck vertical and top alignment of posts and make necessary corrections. Extend concrete footings 2 inches above grade, and trowel to a crown to shed water. Unless otherwise approved by the Architect/Engineer, no materials shall be installed on the posts, nor shall the posts be disturbed within 7 days after the individual post footing is completed.

3.2 ERECTION TOLERANCES

A. Section 01 40 00 “Quality Requirements”: Quality Control.

B. Maximum Variation From Plumb: ¼ inch.

C. Maximum Offset From True Position: 1 inch.

D. Components shall not infringe adjacent property lines.

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS
SECTION 32 33 00 – SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Flower-watering stations, including trash receptacles, water spigot, and flower vase container.
2. Benches.

1.2 RELATED REQUIREMENTS

A. Materials product data and samples: Section 01 33 00 “Submittals”.

B. Concrete footings: Section 03 30 00 “Cast in Place Concrete”.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):
1. ASTM A53/A53M-12 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
3. B61-15 - Steam or Valve Bronze Castings.
4. B62-15 - Composition Bronze or Ounce Metal Castings.

C. American Welding Society (AWS):
1. D1.1-2006 - Structural Welding Code - Steel.
2. D1.2-2014 - Structural Welding Code - Aluminum.

D. National Association of Architectural Metal Manufacturers (NAAMM):
1. AMP 500-06 Metal Finishes Manual.

1.4 SUBMITTALS

A. Submittals Procedures: Section 01 33 00 “Submittals”.

B. Submittal Drawings:
1. Show size, configuration, and fabrication and installation details.
2. Show floral regulations decal content, lettering color and background color.

C. Manufacturer's Literature and Data:
1. Description of each product.
2. Installation instructions.
3. Warranty.

D. Samples:
1. Each Product: 152 mm (6 inch) square, each type and color.
   a. Submit quantity required to show full color and texture range.
2. Benches, Flower Vase Receptacle: Full sized, complete assembly.
3. Approved samples may be incorporated into work.

E. Qualifications: Substantiate qualifications comply with specifications.
1. Manufacturer with project experience list.
2. Fabricator with project experience list.
3. Installer with project experience list.
4. Welders and welding procedures.

1.5 QUALITY ASSURANCE

A. Manufacturer, Fabricator, Installer Qualifications:
   1. Regularly manufactures, fabricates, and installs specified products.
   2. Manufactured, Fabricated, Installed, specified products with satisfactory service on five similar installations for minimum five years.

B. Installer Qualifications: Manufacturer authorized representative.
   1. Regularly installs specified products.
   2. Installed specified products with satisfactory service on five similar installations for minimum five years.

C. Welders and Welding Procedures Qualifications: AWS D1.1/D1.1M.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight, conditioned facility.

B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant benches against material and manufacturing defects.
   1. Warranty Period: Three years.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide each product from one manufacturer and from one production run.

2.2 FLOWER WATERING STATIONS

A. General: Materials, finishes and colors match existing as indicated on Drawings.

2.3 TRASH RECEPTACLE

A. Trash Receptacles: Victor Stanley #3D-42 Ironsites with rain bonnet lid.
   1. Steel Body Construction:
      a. Vertical Bar: Solid steel, 9.53 mm x 25.4 mm (3/8 x 1 inch).
      b. Horizontal Bands: Solid steel, 6.35 mm x 63.5 mm (1/4 x 2-1/2 inches).
      c. Support Bars: Steel, 9.53 mm x 76.2 mm (3/8 x 3 inches).
      d. Top Ring: Solid steel, 15.88 mm (5/8 inch).
      e. Leveling Feet: 9.53 mm (3/8 inch) diameter threaded steel shaft.
      f. Joints: Fully welded, grind smooth.
   2. Capacity: 136 liter (36-gallon).
   3. Inner Liner: High-density plastic inner liner, 2.72 kg (6 lbs.) maximum weight.
   4. Lids: Manufacturer’s standard steel, rain bonnet lid.

5. Mounting Plate: Standard (1) anchor bolt hole.
6. Identification: Identify trash receptacle with the word “TRASH”, material, finish, color, letter style and size as indicated on Drawings.
7. Steel and Powder Coat Finish: Manufacturer's standard shot blasted, etched, phosphatized, preheated, and electrostatically polyester, powder coatings, 8-10 mils (200-250 microns) dry film thickness.
   a. Standard Colors: Victor Stanley Standard Bronze.

2.4 FLOWER VASE RECEPTACLE

A. Materials: Victor Stanley #S-535 Ironsites Receptacle with tapered formed lid.
   1. Size: As indicated on Drawings.
   2. Finish and Color: Same as trash receptacle except as follows:
      a. Identification: Identify flower vase receptacles with the word “FLOWER VASES” as indicated on Drawings.
   3. Mesh Insert: 3” x 3” Stainless Steel Woven Wire Mesh.
      a. Size: .025” Thick (2 ¾ Gauge)
      b. Install at height indicated on Drawing.
   4. Lids: See Drawings for post-manufactured lid design.

2.5 WATER SPIGOT ASSEMBLIES

A. Water spigots, to match existing approved by Architect/Engineer, or approved equal, freeze resistant, with integral shut-off valve.
   1. Housing: Cast aluminum, paint finish, color to match Bronze.
   2. Inner Supply: Solid-brass castings, ASTM B61 and B62.
   3. Lever Handle: Aluminum-bronze casting, self-closing, operates with maximum 2 kg (5 lbs.) force at maximum 275 kPa (40 psi) inlet water pressure.
   4. Outer casings and inner supply line: Manufacturer's standard galvanized steel pipe.
   5. Nozzle: Solid brass casting.
   6. Outlet: Threaded with vacuum breaker.

B. Water spigots to match existing and as indicated on Drawings, ADA compliant, spigot paddle operated, maximum 2 kg (5 lbs.) force water flow, connected to potable.

2.6 BENCHES

A. Description: Front welds ground and polished to form continuous surface from top tubular section to each vertical steel slat. Steel seat members reverse contoured; solid steel bar end sections, welded and ground; no arm rests standard integral welded configuration, with no center armrests.

B. Material: Steel and recycled plastic.

C. Locations, sizes and quantities as indicated Drawings.

D. Finish: Manufacturer's standard shotblasted, etched, phosphatized, preheated, and electrostatically polyester, powder coatings.
   1. Color: VS Black and Maple, approved by Architect/Engineer.

E. Mounting Hardware: Tamper resistance stainless steel. Exposed bolt ends or flat bolt heads are not acceptable.

2.7 FLAG SLEEVES

A. Provide flag sleeves at locations and details on Drawings.

2.8 FINISHES

A. Steel Finish:

1. Powder-Coat Finish: Manufacturer's standard two-coat finish system consisting of the following:
   a. Color: Black.

B. Aluminum Anodized Finish: NAAMM AMP 500.
1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.018 mm (0.7 mil) thick.
2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick.
3. Clear Anodized Finish: AA-C22A31; Class II Architectural, 0.01 mm (0.4 mil) thick.
4. Color Anodized Finish: AA-C22A32 or AA-C22A34; Class II Architectural, 0.01 mm (0.4 mil) thick.

C. Aluminum Paint finish:
1. Baked-Enamel or Powder-Coat Finish: Polyester powder coating. Comply with manufacturer's coating process.
2. Fluorocarbon Finish: AAMA 2605; 70 percent fluoropolymer resin, 2-coat system.

2.9 ACCESSORIES

A. Primers

B. Welding Materials: AWS D1.1/D1.1M, type to suit application.

C. Fasteners: Tamper resistant Stainless steel.
D. Anchors

E. Galvanizing Repair Paint: MPI No. 18.

F. Touch-Up Paint: Match shop finish.

G. Concrete Footing: Comply with Section 03 30 00 “Cast-In-Place Concrete”.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect planned installation materials and locations. Notify Architect/Engineer of any discrepancies in conditions.
1. Verify materials are damage free and compliant with Drawings. Report non-compliance to Architect/Engineer.

3.2 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

C. Remove existing to permit new installation.
1. Dispose of removed materials.

D. Correct substrate deficiencies.
1. Fill.
2. Grind.
3. Level.

3.3 INSTALLATION – GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.
1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Architect/Engineer consideration.

2. Install items rigid and plumb as indicated on Drawings.

B. Flower Watering Stations:
1. Stake flower watering station location. Obtain Architect/Engineer approval before forming concrete pad. Install concrete pad according to Section 03 30 00 “Cast-In-Place Concrete”.
2. Anchor flower vase container as indicated on Drawings and manufacturer's instructions.

C. Water Spigot:
1. Install water spigot assemblies according to manufacturer’s instructions, including pipe, isolation valve, fittings, and valve boxes. Install washed stone for splash area.

D. Benches:
1. Install benches as recommended by Manufacturer.

E. Flag Sleeves:
1. Install flag sleeves with flag poles set plumb and top sleeves set at correct elevation, on finish grade, so as not to interfere with mowing operations.
2. Mark Flag sleeve locations along adjoining roadway, perpendicular to road centerline.

3.4 CLEANING

A. Clean exposed surfaces. Remove contaminants and stains.

B. Polish exposed surfaces gloss sheen.

C. Remove excess material and debris. Clean above ground portions of receptacles and other site improvements.

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS
SECTION 32 84 00 – IRRIGATION SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide an underground irrigation system as shown and specified. The work includes:
1. Irrigation system including piping, drip lines, fittings, sprinkler heads, and accessories.
2. Valves, fittings, and control wire.
3. Controller(s).
4. Testing.
5. Excavating and backfilling irrigation system work.
6. Associated interior and exterior plumbing, and accessories to complete the system (if noted on plans).
7. Pipe sleeves.

B. Related work (if included in construction documents):
1. Section 32 90 00 “Trees, Plants, and Ground Covers”.
2. Section 32 91 00 “Sodding”.

1.2 QUALITY ASSURANCE

A. Contact the manufacturer’s technical representative for assistance with the installation of a decoder system.

B. Installer's qualifications: Minimum of 5 years experience installing irrigation systems of comparable size and having installed a two-wire decoder system.

C. Materials, equipment, and methods of installation shall comply with the following codes and standards:
1. National Fire Protection Association, (NFPA): National Electrical Code.
2. American Society for Testing and Materials, (ASTM).
3. National Sanitation Foundation, (NSF).
4. The Irrigation Association, (IA).

D. Excavating, backfilling, and compacting operations.
1. Test irrigation system prior to installing backfill materials where possible.

1.3 SUBMITTALS

A. Submit manufacturer's product data for controllers.

B. Upon irrigation system acceptance, submit written operating and maintenance instructions.

C. Provide irrigation system record drawings:
1. Locate dimensioned locations of all valves, decoders & grounding.
2. Locate path of main line from service point.

D. Provide instruction to Owner’s representative for operation and maintenance of the system.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.

B. Deliver plastic piping in bundles, packaged to provide adequate protection of pipe ends, both threaded or plain.

C. Store and handle materials to prevent damage and deterioration.

D. Provide secure, locked storage for valves, sprinkler heads, and similar components that cannot be

immediately replaced, to prevent installation delays.

1.5 PROJECT CONDITIONS

A. Known underground and surface utility lines are located on the civil plans. Call for a Utility Locate prior to starting any work.

B. Protect existing trees, plants, lawns, and other features designated to remain as part of the final landscape work.

C. Promptly repair damage to adjacent facilities caused by irrigation system work operations. Cost of repairs at Contractor's expense.

D. Promptly notify the Architect of unexpected sub-surface conditions.

E. Irrigation system layout is diagrammatic. Exact locations of piping, sprinkler heads, valves, and other components shall be established by Contractor in the field at time of installation to conform to minor changes in construction.
   1. Space sprinkler components as indicated.
   2. Minor adjustments in system layout will be permitted to clear existing fixed obstructions. Final system layout shall be acceptable to the Architect.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers: (if products are equal to that which are specified, matching flow, and is approved 10 days prior to bidding.) The system design is based on Hunter Industries, Inc. equipment.
   1. Hunter Industries, Inc.
   2. Rain Bird (Basis of Design)
   3. The Toro Co.

2.2 MATERIALS

A. General:
   1. Provide only new materials, without flaws or defects and of the highest quality of their specified class and kind.
   2. Comply with pipe sizes indicated. No substitution of smaller pipes will be permitted. Larger sizes may be used subject to acceptance of the Architect. Remove damaged and defective pipe.
   3. Provide pipe continuously and permanently marked with manufacturer's name of trademark, size schedule and type of pipe, working pressure at 73 degrees F. and National Sanitation Foundation (NSF) approval.

B. Plastic pipe, fittings, and connections:
   1. Polyvinyl chloride pipe: ASTM D2241, rigid, unplasticized PVC, extruded from virgin parent material. Provide pipe homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, wrinkles, and dents.
      a. 2 1/2" diameter and under: Bell & socket glued.
      b. 3” and above, class 200 shall be integral bell piping supplied with a rubber sealing gasket and lubricant. Fittings shall be compatible for joining to other piping materials.
   2. PVC pipe fittings: ASTM D2241 schedule 40 PVC molded fittings suitable for solvent weld, slip joint ring tight seal, or screwed connections. Fittings made of other materials are not permitted.
      a. Size slip fitting socket taper to permit a dry un softened pipe and to be inserted no more than halfway into the socket. Saddle and cross fittings are not permitted.
      b. Schedule 80 PVC may be threaded.
      c. Use male adapters for plastic to metal connections. Hand tighten male adapters plus one turn with a strap wrench.

C. Drip Irrigation:
1. 18mm drip tubing with 6 GPH emitters spaced 12” o.c.
2. Provide any accessories needed to complete installation.

D. Electrical control wire, splice connectors, and surge protection:
1. Electrical control: Shall be color coded and shall be approved for direct burial.
2. Electrical Splice Connectors: shall be waterproof type.

2.3 ACCESSORIES

A. Drainage fill: 1/2" to 3/4" washed pea gravel

B. Fill: clean soil free of stones larger than 2" diameter foreign matter, organic material, and debris.
1. Provide imported fill material as required to complete the work. Obtain rights and pay all costs for imported materials.
2. Suitable excavated materials removed to accommodate the irrigation system work may be used as fill material subject to the Architect's review and acceptance.

C. Valve access boxes: Tapered enclosure of rigid plastic material comprised of fibrous components chemically inert and unaffected by moisture corrosion and temperature changes. Provide lid of same material, green in color. Size according to number of valves in box.
1. 12" deep x 18" long x 13" wide base dimensions.
2. 10" deep x 13" diameter base dimension.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine final grades and installation conditions. Do not start irrigation system work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Layout and stake the location of each pipe run and all sprinkler heads and sprinkler valves.

B. Place sleeves as indicated for installation of piping and control wire.

3.3 INSTALLATION

A. Excavating and backfilling:
1. All excavation shall be considered unclassified excavation and include all materials encountered.
2. Excavate trenches of sufficient depth and width to permit proper handling and installation of pipe and fittings.
3. If the pulling method is used, the pipe "plow" shall be a vibratory type. Starting and finishing holes for pipe pulling shall not exceed a 1'-0" by 3'-0" opening.
4. Excavating to depths required to provide 2" depth of earth fill or sand bedding for piping when rock or other unsuitable bearing material is encountered.
5. Fill to match adjacent grade elevations with approved earth fill material. Place and compact fill in layers not greater than 8" depth.
6. Install irrigation lines with a minimum cover of 12" based on finished grades.

B. Plastic pipe:
1. Install plastic pipe in accordance with manufacturer's installation instructions. Provide for thermal expansion and contraction.
2. Saw cut plastic pipe larger than 1". Use a square-in-sawing vice, to ensure a square cut. Remove burrs and shavings at cut ends prior to installation.
3. Make plastic to plastic joints with solvent weld joints or slip seal joints. Use only solvent recommended by the pipe manufacturer. Install plastic pipe fittings in accordance with pipe manufacturer's instructions. Contractor shall make arrangements with pipe manufacturer for all necessary field assistance.
4. Make plastic to metal joints with plastic male adapters.

5. Make solvent weld joints in accordance with manufacturer's recommendations.
6. Allow joints to set at least 24 hours before pressure is applied to the system.

C. Sprinklers, fittings, valves, and accessories:
1. Install fittings, valves, sprinkler heads, risers, and accessories in accordance with manufacturer's instructions, except as otherwise indicated.
2. Provide concrete thrust blocks where required at fittings and valves.
3. Set sprinkler heads perpendicular to finished grades, except as otherwise indicated.
4. Install gear driven and spray pop-up sprinklers with an adjustable triple swing joint riser of at least 3 standard 90 degree elbows. Fabricate triple swing joint risers of schedule 80 PVC nipples and schedule 40 PVC elbows. The horizontal nipple connected directly into the side of the lateral line shall be A minimum of 3" long. All other nipples of the swing joint riser shall be of length as required for proper installation of the sprinkler head.
   a. If the sprinkler heads have a side inlet, 2 street ells and a nipple may be used instead of a double swing joint assembly.
5. Install in-ground control valves in a valve access box as indicated.
6. Install valve access boxes on a suitable base of gravel to provide a level foundation at proper grade and to provide drainage of the access box.
7. Seal threaded connections on pressure side of control valves with Teflon tape or approved plastic joint type compound.

D. Control wiring:
1. Install electric control cable in the piping trench wherever possible. Place wire in trench adjacent to pipe. Install wire with slack to allow for thermal expansion and contraction. Expansion joints in wire may be provided at 200-foot intervals by making 5-6 turns of the wire around a piece of 1/2" pipe instead of slack. Where necessary to run wire in a separate trench, provide a minimum cover of 12".
2. Provide sufficient slack at site connections at remote control valves in control boxes, and at all wire splices to allow raising the valve bonnet or splice to the surface without disconnecting the wires when repair is required.
3. Make wire connections to remote control electric valves and splices of wire in the field as specified and in accordance with manufacturer's recommendations. Wire splices shall be made in valve boxes and recorded on the "record drawings".

E. Flushing, testing, and adjustment:
1. After sprinkler piping and risers are installed and before sprinkler heads are installed, open control valves and flush out the system with full head of water.
2. Perform system testing upon completion of each section. Make necessary repairs and retest repaired sections as required.
3. Adjust sprinklers after installation for proper and adequate distribution of the water over the coverage pattern. Adjust for the proper arc of coverage.
4. Adjust all electric remote control valve pressure regulators and flow control stems for system balance and optimum performance.
5. Test and demonstrate the controller by operating appropriate day, hour, and station selection features as required to automatically start and shut down irrigation cycles to accommodate plant requirements and weather conditions.

3.4 DISPOSAL OF WASTE MATERIAL

A. Stockpile, haul from site, and legally dispose of waste materials, including unsuitable excavated materials, rock, trash, and debris.

B. Maintain disposal route clear, clean, and free of debris.

3.5 ACCEPTANCE

A. Test and demonstrate to the Architect and Owner the satisfactory operation of the system free of leaks. Irrigated areas will be inspected at completion of installation and submission of completed Final

Inspection Check List (3.7) at the end of this section.

B. Instruct the Owner's designated personnel in the operation of the system, including adjustment of sprinklers, controller(s), valves, controller, and/or moisture and freeze sensing controls.

C. Upon acceptance the Owner will assume operation of the system.

3.6 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment. Repair all damage resulting from irrigation system installation.

3.7 FINAL INSPECTION CHECK LIST - IRRIGATION

CHECK IF COMPLETE

_____1) As-built as indicated in specifications complete.

_____2) All zones operate properly with final adjustment on all heads.

_____3) All heads in approximate location as indicated on plan.

_____4) High-pops where indicated.

_____5) Pipe class or schedule as specified and minimum 12" cover.

_____6) All pop-up heads 1-2" away from curbs or walks. All stationary risers 6" away from walls and 6" above adjacent planting.

_____7) All exposed risers schedule 80.

_____8) All turf heads on triple swing joints and shrub spray heads on flex pipe.

_____9) All wire splices with waterproof wire connects and in valve boxes.

_____10) All valve boxes have gravel bottom.

_____11) Location of zones identified on plan with zone numbers.

Final inspection will not be scheduled until the above is complete and returned to the Architect

Compliance with the above does not insure final acceptance. Acceptance will be determined at final inspection. The list above represents a small portion of work that is too often overlooked prior to Contractor's request for final inspection. If the Architect observes any non-compliance with any of the items in the above list the final inspection will be terminated and the Contractor will be billed for the inspection at a rate of $125.00/hr. from portal to portal, plus expenses paid prior to any further inspection.

_____

Landscape Contractor Signature Date

_____

General Contractor Signature Date

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS
SECTION 32 90 00 – TREES, PLANTS AND GROUND COVERS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide trees, plants, and ground cover as shown and specified. The work includes:
   1. Soil preparation.
   2. Trees, plants, and ground covers.
   3. Planting mixes.
   4. Mulch and planting accessories.
   5. Maintenance.

B. Related work: (if included in construction documents)
   1. Section 32 84 00 “Irrigation System”.
   2. Section 32 91 00 “Sodding”.

1.2 QUALITY ASSURANCE

A. Comply with general requirements.

B. Plant name indicated, comply with "Standardized Plant Names: as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names of varieties not listed conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legibly tagged.

C. Comply with sizing and grading standards of the latest edition of "American Standard for Nursery Stock. A plant shall be dimensioned as it stands in its natural position.

D. All plants shall be nursery grown under climatic conditions similar to those in the locality of the project for a minimum of 2 years.

E. Stock furnished shall be at least the minimum size indicated. Larger stock is acceptable upon approval by the Architect, at no additional cost, and providing that the larger plants will not be cut back to size indicated.

F. Provide specimen plants with a special height, shape, or character of growth. Plants shall be first quality typical in size for container, root ball or caliper specified.

G. Plants shall be located by the Contractor prior to bidding. They shall be reserved at the time of award of the General Contract and lack of availability at the time of installation will not serve as a legitimate excuse for substitution of plant types due to unavailability.

1.3 DELIVERY, STORAGE, AND HANDLING.

A. Deliver fertilizer materials in original, unopened, and undamaged containers showing weight, analysis, and name of manufacturer. Store in manner to prevent wetting and deterioration.

B. Take all precautions customary in good trade practice in preparing plants for moving. Workmanship that fails to meet the highest standards will be rejected. Spray "Anti-Desiccant" immediately after digging to prevent dehydration. Dig, pack, transport, and handle plants with certificates required by law shall accompany each shipment invoice or order to stock and on arrival, the certificate shall be filed with the Architect. Protect all plants from drying out. If plants cannot be planted immediately upon delivery, properly protect them with soil or sawdust or in a manner acceptable to the Architect. Water heeled-in plantings daily. No plant shall be bound with rope or wire in a manner that could damage or break the branches.

C. Cover plants transported on open vehicles with a protective covering to prevent wind burn.

D. Provide dry, loose topsoil for planting beds. Frozen or muddy topsoil is not acceptable.

1.4 PROJECT CONDITIONS

A. Work notification: Notify Architect at least 7 working days prior to installation of plant material.

B. Protect existing utilities, paving, and other facilities from damage caused by landscaping operations.

C. A complete list of plants, including a schedule of sizes, quantities, and other requirements is shown on the drawings. In the event that quantity discrepancies of material omissions occur in the plant materials list, the planting plans shall govern.

1.5 WARRANTY

A. Warrant plant material to remain alive and be in healthy, vigorous condition for a period of one year after completion and acceptance of entire project.
   1. Inspection of plants will be made by the Architect at completion of planting.

B. Replace, in accordance with the drawings and specifications, all plants that are dead or, as determined by the Architect, are in an unhealthy or unsightly condition, or have lost their natural shape due to dead branches, or other causes due to the Contractors' negligence. The cost of such replacements is at Contractors' expense. Warrant all replacement plants for 1 year from the date of acceptance. Should a plant be damaged due to improper handling or planting, in lieu of replacement, the Architect may require an additional warranty period, up to an additional year.

C. Warranty shall not include damage or loss of trees, plants, or ground covers caused by fires, floods, freezing rains, lighting storms, or winds over 75 miles per hour, winter kill caused by extreme cold and severe winter conditions not typical of planting area; acts of vandalism or negligence on the part of the Owners.

D. Remove and immediately replace all plants, as determined by the Architect, to be unsatisfactory during the initial planting installation.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Plants: Provide plants typical of their species or variety; with normal, densely-developed branches and vigorous, fibrous root systems. Provide only sound, healthy, vigorous plants free from defects, disfiguring knots, sun scald injuries, frost cracks, abrasions of the bark, plant diseases, insect eggs, borers, and all forms of infestation. Trees shall have been root pruned at least once. All plants shall have a fully developed form without voids and open space. Plants shall not be loose in the container or root ball without adequate root structure to support the top.
   1. Dig balled and burlapped plants with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Provide ball sizes complying with the latest edition of the "American Standard for Nursery Stock". Strive for a root ball at 150% of the minimum standard root ball size. Cracked or mushroomed balls are not acceptable
   2. Container-grown stock: Grown in a container for sufficient length of time for the root system to have developed to hold its soil together, firm and whole.
      a. No plants shall be loose in the container.
      b. Container stock shall not be pot bound or have encircling roots.
   3. Provide tree species that mature at heights over 25'-0" with a single main trunk. Trees that have the main trunk forming a "Y" shape are not acceptable unless typical for the species such as Zelkova and Chinese elm. Trees that are not fully branched will not be accepted. Two-thirds of the tree’s total height shall have living branches. Trees shall have no bark damage. Trees shall not be leaning or have significant sheep, crook or bend. Trees shall have no branch more than □ the diameter of the main leader.
   4. Plants planted in rows shall be matched in form.
   5. Plants larger than those specified in the plant list may be used when acceptable to the

Architect.

a. If the use of large plants is acceptable, increase the spread of roots or root ball in proportion to the size of the plant.

6. No pruning wounds shall be present with a diameter of more than 1" and such wounds must show vigorous bark on all edges.
7. Evergreen trees shall be branched to the ground unless specified otherwise. An example would be where "multi-stem" or "min. 3 canes" is noted, then the tree shall be limbed up to expose the lower trunks.
8. Shrubs and small plants shall meet the requirements for spread and height indicated in the plant list. Plants specified in inches means average spread (15"-18"); Plants specified in feet shall mean average height (5'-6').
   a. The measurements for height shall be taken from the ground level to the average height of the top of the plant and not the longest branch.
   b. Single stemmed or thin plants will not be accepted.
   c. Side branches shall be generous, well-twigged, and the plant as a whole well-bushed to the ground.
   d. Plants shall be in a moist, vigorous condition, free from dead wood, bruises, or other root or branched injuries.

2.2 ACCESSORIES

A. Topsoil: 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, with acidity range of between pH 6.0 and 6.8.

1. Provide topsoil free of substances harmful to the plants which will be grown in the soil.

B. Anti-Desiccant: Protective film emulsion providing a protective film over plant surfaces; permeable to permit transpiration. Mixed and applied in accordance with manufacturer's instructions.

C. Pre-emergence herbicide shall be Surflan, Ranstar or Deverinol.

D. Mulch: Free of deleterious materials and stored to prevent inclusion of foreign material.

1. Mineral Mulch: Riverbank stone, granite chips, marble chips, volcanic rock or similar and ranging from 25 mm (1 inch) to 65 mm (2-1/2 inches) according to ASTM C 136.
2. Organic Mulch: Wood based products such as chips, nuggets or shredded hardwood.
3. Straw for turfgrass seedbed mulch: Stalks from oats, wheat, rye, barley, or rice free of noxious weeds, mold or other objectionable material. Straw to be air-dried and suitable for placing with blower equipment.

E. Water: Free of substances harmful to plant growth. Hoses or other methods of transportation furnished by contractor.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine proposed planting areas and conditions of installation. Do not start planting work until unsatisfactory conditions are corrected

3.2 PREPARATION

A. Time of planting:
   1. Evergreen material: Plant evergreen materials between September 1, and November 1 or in the spring before new growth begins. If project requirements require planting at other times plants shall be sprayed with anti-desiccant prior to planting operation and shall be in a container or root control bag.
   2. Deciduous material: Plant deciduous materials in a dormant condition. If deciduous trees

are planted in-leaf, they shall be sprayed with an anti-desiccant prior to planting operation.

3. Planting times other than those indicated shall be acceptable to the Architect.

B. Planting shall be performed only by experienced workmen familiar with planting procedures under the supervision of a qualified supervisor.

C. Locate plants as indicated or as approved in the field after staking (location) by the Contractor. If obstructions or unsuitable subsurface conditions are encountered that are not shown on the drawings, do not proceed with planting operations until alternate plant locations have been selected and approved by the Architect. If vegetation is present spray beds with approved herbicides prior to any planting.

D. Excavate circular plant pits with slanted sides, except for plants specifically indicted to be planted in beds. Provide shrub pits at least two times the root ball and three times for trees. Depth of pit shall accommodate the root system. Scarify the bottom of the pit to a depth of 4". Remove excavated materials from the site.

3.3 INSTALLATION

A. Set plant material in the planting pit to proper grade and alignment. Set plants upright, plumb, and faced to give the best appearance or relationship to each other or adjacent structure. Set plant material 1" above the finish grade. No filling will be permitted around trunks or stems. Do not use frozen or muddy mixtures for backfilling. Plant in a straight line if so shown on the plans.

B. After balled and burlapped plants are set, muddle planting soil mixture around bases of balls and fill all voids.

1. Remove all burlap, ropes, straps and wires from the root balls. If it is not possible to remove burlap from bottom of ball, cut away burlap from sides and remove from hole.

C. Space ground cover plants in accordance with indicated dimensions. Adjust spacing as necessary to evenly fill planting bed with indicated quantity of plants.

D. Spread and arrange roots of bare-rooted plants in their natural position. Work-in planting mixture. Do not mat roots together. Cut all broken and frayed roots before installing planting mixture.

E. Drainage: Do not plant any plant wherever water is seeping or standing in the hole. Notify the Architect if such condition occurs.

F. Mulching:

1. Mulch tree and shrub planting pits and shrub beds with required mulching material immediately after planting. Thoroughly water mulched areas. After watering, rake mulch to provide a uniform finished surface.
    a. Apply pre-emergence herbicide (if noted on plans) prior to mulching as per manufacturer's recommendation.

G. Pruning:

1. Prune dead or dying branches, only of deciduous stock, after planting to balance the loss of roots and preserve the natural character appropriate to the particular plant requirements. In general, remove 1/4 to 1/3 of the leaf bearing buds, proportion shall in all cases be acceptable to the Architect. Remove or cut back broken, damaged, and unsymmetrical growth of new wood.

H. Care of existing trees:

1. Selectively prune existing trees in designated areas, under Architect's direction. Remove sucker shoots, dead, rubbing, and damaged branching.

3.4 MAINTENANCE

A. Maintain plantings until completion and acceptance of the entire project.

B. Maintenance shall include pruning, cultivating, weeding, watering, and application of appropriate insecticides and fungicides necessary to maintain plants free of insects and disease.
   1. Re-set settled plants to proper grade and position. Remove dead branches and dead plant material.
   2. Correct defective work as soon as possible after deficiencies become apparent and weather and season permit.
   3. Water trees, plants, and ground cover beds within the first 24 hours of initial planting, and not less than twice per week until final acceptance.

3.5 ACCEPTANCE

A. Planted areas will be inspected at completion of installation and submission of completed "Final Inspection Check List" (3.07) at the end of this section. Acceptance will be subject to compliance with all specified materials and installation requirements.

B. Inspection to determine acceptance of planted areas will be made by the Architect, upon Contractor's request. Provide notification at least 5 working days before requested inspection date.
   1. Planted areas will be accepted provided all requirements, including maintenance, have been complied with and plant materials are alive and in a healthy, vigorous condition. Beds shall be weed free prior to any inspection or acceptance.

C. Upon acceptance, the Owner will assume plant maintenance.

3.6 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment. Repair damage resulting from planting operations.

3.7 FINAL INSPECTION CHECK LIST - LANDSCAPING

CHECK IF COMPLETE

_____1) Plants & trees of correct nomenclature and sized as specified. Grade A nursery stock. All dead or non-compliant plants have been replaced.

_____2) Trees and shrubs planted even or slightly above grade.

_____3) All trees plumb

_____4) Burlap, straps, ties, wire, etc. removed from sides of root ball.

_____5) Bed line trenched in as shown on detail sheet to include trees.

_____6) Mulch at compacted thickness as specified.

_____7) Grass areas smooth and evenly graded with no rocks or sticks present. Grass has been mowed just prior to final inspection.

_____8) Sod laid no higher than walks, borders and curbs; joints grown in and mowed just prior to final inspection.

_____9) No weeds present in plant beds or tree pits.

Final inspection will not be scheduled until all of the above are completed and this form is returned to the Architect: Compliance with the above does not insure final acceptance. Acceptance will be determined at final inspection. The list above represents a small portion of work that is too often overlooked prior to Contractor's request for final inspection. If the Architect observes any non-compliance with any of the items in the above list the final inspection will be terminated and the Contractor will be billed for the inspection at a rate of $125.00/hr. from portal to portal, plus expenses paid prior to any further inspection.

Landscape Contractor Signature Date

General Contractor Signature Date

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS
SECTION 32 91 00 – SODDING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide sodding lawns as shown and specified. The work includes:
   1. Soil preparation.
   2. Sodding lawns, and/or other open earth areas so specified.
   3. Maintenance.

B. Related work (if included in construction documents):
   1. Section 32 84 00 “Irrigation System”.
   2. Section 32 90 00 “Trees, Plants, and Ground Covers”.

1.2 QUALITY ASSURANCE

A. Sod: Comply with American Sod Producers Association (ASPA) classes of sod materials.

1.3 SUBMITTALS

A. Submit sod grower’s certification of grass species. Identify source location.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Cut, deliver, and install sod within a 24-hour period.
   1. Do not harvest or transport sod when moisture content may adversely affect sod survival.
   2. Protect sod from sun, wind, and dehydration prior to installation.
   3. Do not tear, stretch, or drop sod during handling and installation.

1.5 PROJECT CONDITIONS

A. Work notification: Notify Architect at least 5 working days prior to start of sodding operations.

B. Protect existing utilities, paving, and other facilities from damage caused by sodding operations.

C. Perform sodding work only after planting and other work affecting ground surface has been completed.

D. Restrict traffic from lawn areas until grass is established. Erect signs and barriers, if necessary.

E. Provide hose and lawn watering equipment as required.

1.6 WARRANTY

A. Provide a uniform stand of grass by watering, mowing, and maintaining lawn areas until final acceptance. Resod areas, with specified materials, which fail to provide a uniform stand of grass until all affected areas are accepted by the Architect. No bare spots or dead sod shall be accepted.

PART 2 – PRODUCTS

A. Sod: An "approved" nursery grown sod composed of the one of the following grass species as noted on the plans: Provide sod free of grassy or broadleaf weeds. Sod shall be as follows unless otherwise specified on plans:
   1. TifTuf Bermuda - preferred
   2. Tifway 419 Bermuda – if preferred species is not avaialble

B. Provide well-rooted, healthy sod, free of diseases, nematodes and soil borne insects. Provide sod uniform in color, leaf texture, density, and free of weeds, undesirable grasses, stones, roots, thatch, and extraneous material; viable and capable of growth and development when planted.

1. Furnish sod machine stripped and of Supplier's standard width, length, and thickness: Uniformly 1" to 1-1/2" thick with clean cut edges. Mow sod before stripping. The contractor shall supply 2’ x 112’-6” rolls for all large areas.

C. Fertilizer:
1. Granular, non-burning product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer.
a. Type A: Starter fertilizer containing 10% nitrogen, 10% phosphoric acid, and 10% potash by weight or similar approved composition.
b. Type B: (if installed during growing season) Top dressing fertilizer containing 31% nitrogen, 3% phosphoric acid, and 10% potash by weight or similar approved composition.

D. Ground Limestone: Containing not less than 85% of total carbonates and ground to such fineness that 50% will pass through a 100 mesh sieve and 90% will pass though a 20 mesh sieve.

E. Water: Free of substance harmful to sod growth. Hoses or other methods of transportation furnished by Contractor.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine finish surfaces, grades, topsoil quality, and depth. Do not begin sodding work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Limit preparation to areas which will be immediately sodded.

B. Loosen topsoil of lawn areas to minimum depth of 4". Remove stones over 3/4" in any dimension and sticks, roots, rubbish, and extraneous matter.

C. Grade lawn areas to smooth, free draining and even surface with a loose, uniformly fine texture. Roll and rake; remove ridges and fill depressions as required to drain.

D. Apply limestone at rate of 1,500 lbs. per acre. Distribute evenly by machine and incorporate thoroughly into topsoil.

E. Apply Type A fertilizer at the rate equal to 1.0 lb. of actual nitrogen per 1,000 sq. ft. Apply fertilizer by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with the soil to a depth of 3" by disking or other approved methods. Fertilize areas inaccessible to power equipment with hand tools and incorporate it into soil. Notify the Architect prior to liming and fertilization operations.

F. Dampen dry soil prior to sodding.

G. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to sodding.

3.3 INSTALLATION

A. Sodding:
1. Lay sod to form a solid mass with tightly-fitted joints. Butt ends and sides of sod strips. Do not overlay edges. Stagger strips to offset joints in adjacent courses. Remove excess sod to avoid smothering of adjacent grass. Provide sod pad top flush and with and not above adjacent curbs, sidewalks, drains, and seeded areas.
2. Install initial row of sod in a straight line, beginning at bottom of slopes, perpendicular to direction of the sloped area. Place subsequent rows parallel to and lightly against previously installed row.

3. Peg sod on slopes greater than 3 to 1 to prevent slippage at a rate of 2 stakes per yd. of sod, if necessary.
4. Water sod thoroughly with a fine spray immediately after laying.
5. Roll with light lawn roller to ensure contact with sub-grade.

B. Sod indicated areas within contract limits.

3.4 MAINTENANCE

A. Maintain sodded lawns until completion and acceptance of the entire project.
1. Water sod thoroughly as required to establish proper rooting.
2. Repair, rework, and resod all areas that have washed out or are eroded. Replace undesirable or dead areas with new sod.
3. Mow lawn areas as soon as lawn top growth reaches a 3" height and cannot be pulled up. Cut back to 2" height. Repeat mowing as required to maintain specified height. Not more than 40% of grass leaf shall be removed at any single mowing. Mowing shall be accomplished until acceptance.
4. Apply Type B fertilizer to lawns approximately 30 days after sodding at a rate equal to 1.0 lb. of actual nitrogen per 1,000 sq. ft. (140 lbs/acre). Apply with a mechanical rotary or drop type distributor. Thoroughly water into soil. Notify the Architect prior to fertilization operations.
5. Apply herbicides as required to control weed growth or undesirable grass species.
6. Apply fungicides and insecticides as required to control diseases and insects.

3.5 ACCEPTANCE

A. Inspection to determine acceptance of sodded lawns will be made by the Architect, upon Contractor's request. Provide notification at least 5 working days before requested inspection date.
1. Sodded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, even colored viable lawn is established, free of weed, undesirable grass species, disease, insects and no dead sod or bare spots. Sod shall have been mowed at least twice if installed in growing season. Sod shall have been mowed not more than three days prior to inspection. If mowing has not been accomplished, acceptance will not be made.
2. Sodded areas shall be smooth. They shall be free of any ruts, depressions and uneven topography. Any area possessing these conditions will be rejected and shall be repaired prior to any acceptance.

B. Upon acceptance, the Owner will assume lawn maintenance. Until then it will be the responsibility of the contractor to provide maintenance.

3.6 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from sodding operations.

END OF SECTION

DIVISION 32 – EXTERIOR
SECTION 32 92 00 – HYDRO-SEEDING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide seeded lawns as shown and specified. The work includes:
1. Soil preparation.
2. Hydro-seeding open earth areas, not otherwise sodded, planted or surfaced.
3. Mulching.
4. Maintenance.

B. Related Work:
1. Section 32 84 00 “Irrigation System.”
2. Section 32 91 00 “Sodding”.
3. Section 32 90 00 “Trees, Plants, and Ground Covers”.

1.2 QUALITY ASSURANCE

A. Comply with acceptable industry standards.

1.3 SUBMITTALS

A. Submit seed vendor certification for required grass seed mixture, indicating percentage by weight, and percentages of purity, germination, and weed seed for each grass species.

B. Submit proof that Princess 77 Bermuda was purchased for this project by submitting invoices.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver seed and fertilizer materials in original unopened containers, showing weight, analysis, and name of manufacturer. Store in a manner to prevent wetting and deterioration.

1.5 PROJECT CONDITIONS

A. Work notification: Notify Architect at least 5 working days prior to start of seeding operations.

B. Protect existing utilities, paving, and other facilities from damage caused by seeding operations.

C. Perform seeding work only after planting and other work affecting ground surface has been completed. If season does not permit seeding of Bermuda, the contractor must seed Browntop millet or Annual Ryegrass (temporary grass) and return to the site the following spring, perform soil preparation and reseed with Bermuda (permanent grass) as specified. The contractor shall schedule all grading work so that grassing can be accomplished during the proper season.

1.6 WARRANTY

A. Provide a uniform stand of grass by watering, mowing, and maintaining seeded areas until final acceptance. Reseed areas, with specified materials, which fail to provide a uniform stand of grass until all affected areas are accepted by the Architect.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Lawn seed: Fresh, clean, and new crop seed mixture.
1. Mixed by an approved method.

2. Composed of the following varieties, mixed to the specified proportions by weight and tested to minimum percentages of purity and germination. Poa Annua, Bent grass, and noxious weed seed free.

B. Grass seeding (where specified on plans).
1. "Princess 77" Bermuda (permanent) as supplied by Pennington Seed
2. Browntop millet (temporary)
3. Annual Ryegrass (temporary)

C. Fertilizer:
1. Granular, non-burning product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer.
a. Type A: Starter fertilizer containing 10% nitrogen, 10% phosphoric acid, and 10% potash by weight or similar approved composition.
b. Type B: Top dressing fertilizer (if installed during growing season only) containing 31% nitrogen, 3% phosphoric acid, and 10% potash by weight or similar approved composition.

D. Ground limestone: Containing not less than 85% of total carbonates and ground to such fineness that 50% will pass through a 100 mesh sieve and 90% will pass through a 20 mesh sieve.

E. Wood cellulose fiber mulch: Degradable green dyed wood cellulose fiber or 100% recycled long fiber pulp, free from weeds or other foreign matter toxic to seed germination and suitable for hydromulching.

F. Tackifier: Liquid concentrate diluted with water forming a transparent 3-dimensional film like crust permeable to water and air and containing no agents toxic to seed germination.

G. Water: Free of substance harmful to seed growth. Hoses or other methods of transportation furnished by Contractor.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine finish surfaces, grades, topsoil quality, and depth. Do not start seeding work until unsatisfactory conditions are corrected. If started then the conditions are considered acceptable by the grassing contractor.

3.2 PREPARATION

A. Limit preparation to areas which will be immediately seeded. Areas to be seeded are to be brought to final grade. All open earth areas not surfaced, planted or sodded shall be seeded.

B. Loosen topsoil of lawn areas to minimum depth of 4". Remove stones over 1" in any dimension and sticks, roots, rubbish, and extraneous matter.

C. Grade areas to a smooth, free draining even surface with a loose, moderately coarse texture. Roll and rake, remove ridges, and fill depressions as required to drain.

D. Apply limestone, at rate of 4,000 lbs per acre. Distribute evenly by machine and incorporate thoroughly into topsoil.

E. Apply type A fertilizer to indicated turf areas at a rate equal to 1.0 lb. of actual nitrogen per 1,000 sq. ft. Apply fertilizer by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with soil to a depth of 3" by disking or other approved method. Fertilize areas inaccessible to power equipment with hand tools and incorporate into soil.

F. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine

grading and prior to seeding.

3.3 INSTALLATION:

A. Hydro-seeding:
1. Use a hydromulcher (sprayer) and apply mixture(s) at the following rates. Mix in accordance with manufacturer's recommendations.
2. Apply mixture A hydroseed slurry to indicated steep erosion prone areas.
a. Seed: Princess 77 Bermuda 44 lbs./acre and Browntop millet 10 lbs./acre or Ryegrass 200 lbs./acre
b. Type A fertilizer: As specified above.
c. Tackifier: 60 gals/acre.
d. Wood cellulose fiber mulch: 2,000 lbs./acre.
e. Limestone: Rate as specified above.

3. Provide straw bale checking in ditches or problem swales at intervals required to adequately slow water velocity and impede soil loss.

4. Seed shall be distributed by a hand broadcast spreader. A roll type seed planter shall be used to press the seed into the top ¼" of the soil.

3.4 MAINTENANCE

A. Maintain seeded lawns until completion and acceptance of the entire project.

B. Maintain seeded lawn areas, including watering, spot weeding, mowing, applications of herbicides, fungicides, insecticides, and re-seeding until a full, uniform stand of grass free of weeds, undesirable grass species, disease, and insects is achieved and accepted by the Architect. The areas to be grassed were cultivated fields and were heavily infested with weeds when a site visit was made. The contractor should expect to provide post emergence herbicide treatments to gain acceptance.
1. Water to maintain adequate surface soil moisture for proper seed germination. Continue watering for not less than 30 days. Thereafter apply 1/2" of water twice weekly until acceptance.
2. Repair, rework, and re-seed all areas that have washed out, are eroded, or do not catch.
3. Mow lawn areas as soon as lawn top growth reaches a 3" height. Cut back to 2" in height. Repeat mowing as required to maintain specified height.
4. Apply Type B fertilizer (if installed during growing season only) to lawns approximately 30 days after seeding at a rate equal to 1.0 lb. of actual nitrogen per 1000 sq. ft. (140 lbs./acre). Apply with mechanical rotary or drop type distributor. Thoroughly water into soil.

C. Maintain seeded banks, ditches, medians, and fields to the extent of establishment only. Re-grade and re-seed washed out or eroded areas as required until a suitable cover is established.

3.5 ACCEPTANCE

A. Inspection to determine acceptance of permanent seeded lawns will be made by the Architect, upon Contractor's request. Provide notification at least 10 working days before requested inspection date.
1. Permanent seeded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, uniform, close stand of the specified permanent grass is established, free of weeds, undesirable grass species, disease, and insects. All areas shall be smooth.
2. No individual lawn areas shall have bare spots greater than 1 sq. ft. and shall have a 95% cover.

B. Upon acceptance, the Owner will assume lawn maintenance.

3.6 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site

all excess materials, debris, and equipment. Repair damage resulting from seeding operations.

END OF SECTION

SECTION 33 08 00
COMMISSIONING OF SITE UTILITY SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

A. The requirements of this Section apply to all sections of Division 31.

B. This project will have selected building systems commissioned. The complete list of equipment and systems to be commissioned is specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS. The commissioning process, which the Contractor is responsible to execute, is defined in Section 01 91 00 GENERAL COMMISSIONING REQUIRMENTS. A Commissioning Agent (CxA) appointed by the VA will manage the commissioning process.

1.2 RELATED WORK

A. Section 01 00 01 GENERAL REQUIREMENTS (MAJOR NCA PROJECTS)

B. Section 01 00 02 GENERAL REQURIEMENTS (MINOR NCA PROJECTS).

C. Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.

D. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

1.3 SUMMARY

A. This Section includes requirements for commissioning the Facility site utilities systems, related subsystems and related equipment. This Section supplements the general requirements specified in Section 01 91 00 General Commissioning Requirements.

B. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for more details regarding processes and procedures as well as roles and responsibilities for all Commissioning Team members.

1.4 DEFINITIONS

A. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for definitions.

1.5 COMMISSIONED SYSTEMS

A. Commissioning of a system or systems specified in Division 33 is part of the construction process. Documentation and testing of these systems, as well as training of the NCA’s Operation and Maintenance personnel in accordance with the requirements of Section 01 91 00 and of Division 33, is required in cooperation with the VA and the Commissioning Agent.

B. The Facility site utilities systems commissioning will include the systems listed in Section 01 91 00 General Commissioning Requirements:

1.6 SUBMITTALS

A. The commissioning process requires review of selected Submittals that pertain to the systems to be commissioned. The Commissioning Agent will provide a list of submittals that will be reviewed by the Commissioning Agent. This list will be reviewed and approved by the VA prior to forwarding to the Contractor. Refer to Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, and SAMPLES for further details.

B. The commissioning process requires Submittal review simultaneously with engineering review. Specific submittal requirements related to the commissioning process are specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 CONSTRUCTION INSPECTIONS

A. Commissioning of Site Utility systems will require inspection of individual elements of the site utility systems construction throughout the construction period. The Contractor shall coordinate with the Commissioning Agent in accordance with Section 01 91 00 and the Commissioning plan to schedule site utility systems inspections as required to support the Commissioning Process.

3.2 PRE-FUNCTIONAL CHECKLISTS

A. The Contractor shall complete Pre-Functional Checklists to verify systems, subsystems, and equipment installation is complete and systems are ready for Systems Functional Performance Testing. The Commissioning Agent will prepare Pre-Functional Checklists to be used to document equipment installation. The Contractor shall complete the checklists. Completed checklists shall be submitted to the VA and to the Commissioning Agent for review. The Commissioning Agent may spot check a sample of completed checklists. If the Commissioning Agent determines that the information provided on the checklist is not accurate, the Commissioning Agent will return the marked-up checklist to the Contractor for correction and resubmission. If the Commissioning Agent determines that a significant number of completed checklists for similar equipment are not accurate, the Commissioning Agent will select a broader sample of checklists for review. If the Commissioning Agent determines that a significant number of the broader sample of checklists is also inaccurate, all the checklists for the type of equipment will be returned to the Contractor for correction and resubmission. Refer to SECTION 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for submittal requirements for Pre-Functional Checklists, Equipment Startup Reports, and other commissioning documents.

3.3 CONTRACTORS TESTS

A. Contractor tests as required by other sections of Division 33 shall be scheduled and documented in accordance with Section 01 00 00 GENERAL REQUIREMENTS. All testing shall be incorporated into the project schedule. Contractor shall provide no less than 7 calendar days' notice of testing. The Commissioning Agent will witness selected Contractor tests at the sole discretion of the Commissioning Agent. Contractor tests shall be completed prior to scheduling Systems Functional Performance Testing.

3.4 SYSTEMS FUNCTIONAL PERFORMANCE TESTING

A. The Commissioning Process includes Systems Functional Performance Testing that is intended to test systems functional performance under steady state conditions, to test system reaction to changes in operating conditions, and system performance under emergency conditions. The Commissioning Agent will prepare detailed Systems Functional Performance Test procedures for review and approval by the Resident Engineer. The Contractor shall review and comment on the tests prior to approval. The Contractor shall provide the required labor, materials, and test equipment identified in the test procedure to perform the tests. The Commissioning Agent will witness and document the testing. The Contractor shall sign the test reports to verify tests were performed. See Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS, for additional details.

3.5 TRAINING OF VA PERSONNEL

A. Training of the VA operation and maintenance personnel is required in cooperation with the Resident Engineer and Commissioning Agent. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. Contractor shall submit training agendas and trainer resumes in accordance with the requirements of Section 01 91 00. The instruction shall be scheduled in coordination with the VA Resident Engineer after submission and approval of formal training plans. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS and Division 33 Sections for additional Contractor training requirements.

END OF SECTION

SECTION 33 10 00
WATER UTILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Underground water distribution system complete, ready for operation, including all appurtenant structures, and connections to existing potable water supply.

B. Definitions:

1. Water Distribution: Pipelines and appurtenances which are part of the distribution system. The distribution system comprises the network of piping located throughout the site, as applicable, and in the building areas that provides water from the potable water supply source for the project, including hydrants, valves, and other appurtenances used to supply water for domestic purposes only when required due to Life Safety issues.
2. Water Service Line: Pipe line connecting building piping to water distribution lines.

1.2 RELATED WORK

A. Section 01 00 02, GENERAL REQUIREMENTS (Minor NCA Projects).
B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
C. Section 01 42 19, REFERENCE STANDARDS.
D. Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS. Erosion and Sediment Control.
E. Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
F. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS.
G. //Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.
H. Section 03 30 53, (SHORT-FORM) CAST-IN-PLACE CONCRETE.
I. Section 09 91 00, PAINTING.
J. Section 31 20 00, EARTH MOVING: Excavation, trench widths, pipe bedding, backfill, shoring, sheeting, bracing.

K. Section 32 30 00, SITE FURNISHINGS: Flower Watering Spigot Assemblies.

1.3 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
B. American Society of Mechanical Engineers (ASME):
A112.6.3-2016.....Floor and Trench Drains

B16.1-2010.....Gray Iron Pipe Flanges and Flanged Fittings, Classes 25, 125 and 250
B16.18-2012.....Cast Copper Alloy Solder Joint Pressure Fittings
B16.26-2013.....Cast Copper Alloy Fittings for Flared Copper Tubes
B18.2.2-2015.....Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
B18.5.2.1M-2006 (R2011).....Metric Round Head Short Square Neck Bolts
ASME Boiler and Pressure Vessel Code -
BPVC Section IX-2015.....Welding, Brazing, and Fusing Qualifications

C. American Society of Safety Engineers (ASSE):
1003-2009 Water Pressure Reducing Valves

D. American Society for Testing and Materials (ASTM):
A36/A36M-2014.....Standard Specification for Carbon Structural Steel
A47/A47M-1999 (R2014).....Standard Specification for Ferritic Malleable Iron Castings
A48/A48M-2003 (R2012).....Standard Specification for Gray Iron Castings
A148/A148M-2015a .....Standard Specification for Steel Castings, High Strength, for Structural Purposes
A307-2014.....Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
A536-1984(R2014) .....Standard Specification for Ductile Iron Castings
A563–2015.....Standard Specification for Carbon and Alloy Steel Nuts
B61-2015.....Standard Specification for Steam or Valve Bronze Castings
B62-2015.....Standard Specification for Composition Bronze or Ounce Metal Castings
B88-2014.....Standard Specification for Seamless Copper Water Tube
B117-2011.....Standard Practice for Operating Salt Spray (Fog) Apparatus
B633-2013.....Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
C443-2012.....Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
C857-2014.....Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
C858-2010e1.....Standard Specification for Underground Precast Concrete Utility Structures
D1785-2015.....Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
D2000-2012.....Standard Classification System for Rubber Products in Automotive Applications

D2464-2015.....Standard Specification for Threaded Poly(Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
D2467-2015.....Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
D2672-2014.....Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement
D4101-2014.....Standard Specification for Polypropylene Injection and Extrusion Materials
F437-2015 .....Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
F439-2013 .....Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
F441/F441M-2015 .....Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
F477-2014 .....Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
F593-2013a .....Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

E. American Water Works Association (AWWA):

B300-2010.....Hypochlorites
B301-2010.....Liquid Chlorine
C104-2013.....Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
C105-2010.....Polyethylene Encasement for Ductile-Iron Pipe Systems
C110-2012.....Ductile-Iron and Gray-Iron Fittings
C111-2012.....Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
C115-2011.....Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
C150-2014.....Thickness Design of Ductile-Iron Pipe
C151-2009.....Ductile-Iron Pipe, Centrifugally Cast
C153-2011.....Ductile-Iron Compact Fittings
C502-2014.....Dry-Barrel Fire Hydrants
C504-10.....Rubber-Seated Butterfly Valves
C508-2009.....Swing-Check Valves for Waterworks Service, 50 mm thru 600 mm (2 inches through 24 inches) NPS
C509-2009.....Resilient-Seated Gate Valves for Water Supply Service
C510-2007.....Double Check Valve Backflow Prevention Assembly
C511-2007.....Reduced-Pressure Principle Backflow Prevention Assembly

C512-07.....Air Release, Air/Vacuum and Combination Air Valves
C550-2013.....Protective Interior Coatings for Valves and Hydrants
C600-2010.....Installation of Ductile Iron Water Mains and Their Appurtenances
C605-2013.....Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
C651-2014.....Disinfecting Water Mains
C700-2015.....Cold-Water Meters – Displacement Type, Metal Alloy Main Case
C701-2015.....Cold-Water Meters – Turbine Type, for Customer Service
C702-2015.....Cold-Water Meters – Compound Type
C706-2010(Withdrawn) .....Direct-Reading, Remote-Registration Systems for Cold-Water Meters
C707-2010.....Encoder-Type Remote-Registration Systems for Cold-Water Meters
C800-2014.....Underground Service Line Valves and Fittings
C900-2007.....Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 100 mm Through 300 mm (4 inches Through 12 inches), for Water Transmission and Distribution
C906-15.....Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 64 In. (1,600 mm), for Water Distribution and Transmission

F. American Welding Society (AWS):
A5.8/A5.8M-2011 .....Specification for Filler Metals for Brazing and Braze Welding

G. Copper Development Association, Inc. (CDA):
A4015.....Copper Tube Handbook

H. National Fire Protection Association (NFPA):
24-2016 .....Standard for the Installation of Private Fire Service Mains and Their Appurtenances

I. NSF International:
61-2014a.....Drinking Water System Components-Health Effects

J. University of Southern California Foundation for Cross Connection Control and Hydraulic Research (USC FCCCHR):
9th Edition.....Manual of Cross-Connection Control

1.4 SUBMITTALS

A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 33 10 00, WATER UTILITIES", with applicable paragraph identification.

C. Make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements and will fit the space available.

D. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval by VA will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.

E. Prior to submitting shop drawings for approval, certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.

F. Provide lists of previous installations by the installing contractor. Contact persons who will serve as references, with telephone numbers and e-mail addresses shall be submitted with the references.

G. Manufacturers' Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity. Submit all items as one package. Ductile iron pipe and Polyvinyl Chloride (PVC) shall be in accordance with AWWA C600 and AWWA C605 respectively.

1. Piping.
2. Fittings
3. Gaskets.
4. Valves.
5. Yard hydrants.
6. Valve boxes.
7. Corporation and curb stops.
8. Curb stop boxes.
9. Joint restraint.
10. Disinfection products.
11. Warning Tape

H. Submittals and shop drawings for interdependent items, containing applicable descriptive information, shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group to provide a compatible and efficient installation. Final review and approvals will be made only by groups.

I. Complete operating and maintenance manuals including wiring diagrams, technical data sheets, information for ordering replacement parts, and troubleshooting guide:

1. Include complete list indicating all components of the systems.
2. Include complete diagrams of the internal wiring for each item of equipment.
3. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.

J. Testing Certifications:

1. Hydrostatic Testing.
2. Certification of Disinfection, including free chlorine residuals, and bacteriological examinations.

K. Completed System Readiness Checklist provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.

L. Submit training plans and instructor qualifications in accordance with the requirements of Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.

1.5 QUALITY ASSURANCE

A. Products Criteria:

1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture, supply, and servicing of the specified products for at least 5 years. However, digital electronics devices, software, and systems such as controls, instruments, and computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least 5 years.
2. Equipment Service: There shall be permanent service organizations, authorized and trained by manufacturers of the equipment supplied, located within 160 km (100 miles)of the project. These organizations shall come to the site and provide acceptable service to restore operations within four hours of receipt of notification by phone, e-mail, or fax in event of an emergency, such as the shut-down of equipment; or within 24 hours in a non-emergency. Names, mail, e-mail addresses, and phone numbers of service organizations providing service under these conditions for (as applicable to the project): pumps, compressors, water heaters, critical instrumentation, computer workstation, and programming shall be submitted for project record and inserted into the operations and maintenance manual.
3. All items furnished shall be free from defects that would adversely affect the performance, maintainability, and appearance of individual components and overall assembly.
4. The products and execution of work specified in Division 33 shall conform to the referenced codes and standards as required by the specifications. Local codes and amendments enforced by the local code official shall be enforced, if required by local authorities such as the natural gas supplier. If the local codes are more stringent, then the local code shall apply. Any conflicts shall be brought to the attention of the (COR).
5. Multiple Units: When two or more units of the same type or class of materials or equipment are required, these units shall be the product of one manufacturer.
6. Assembled Units: Ensure that manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
7. Nameplate: Nameplate bearing manufacturer's name or identifiable trademark securely affixed in a conspicuous place on equipment or name or trademark cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.
8. Use of asbestos containing products, equipment, or materials is prohibited.

B. Comply with the rules and regulations of the Public Utility having jurisdiction over the connection to Public Water lines and the extension, and/or modifications to Public Utility systems.

C. Comply with all rules and regulations of Federal, State, and Local Health Department, Georgia Environmental Protection Division, having jurisdiction over the design, construction, and operation of potable water systems.

D. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed or electronic copies of these recommendations shall be furnished to the COR prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

E. Welding: Before any welding is performed, submit a certificate certifying that welders comply with the following requirements:

1. Qualify welding processes and operators for piping according to ASME BPVC Section IX.
2. Comply with provisions of ASME B31 series "Code for Pressure Piping".
3. Certify that each welder and welding operator has passed American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.
4. All welds shall be stamped according to the provisions of the American Welding Society.

F. Execution (Installation, Construction) Quality:

1. All items shall be applied and installed in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract documents shall be referred to the COR for resolution. Printed copies or electronic files of manufacturer’s installation instructions shall be provided to the COR at least 10 working days prior to commencing installation of any item.
2. All items that require access, such as for operating, cleaning, servicing, maintenance, and calibration, shall be easily and safely accessible by persons standing at floor level, or standing on permanent platforms, without the use of portable ladders. Examples of these items include, but are not limited to: all types of valves, filters and strainers, transmitters, and control devices. Prior to commencing installation work, refer conflicts between this requirement and contract documents to COR for resolution.
3. Complete layout drawings shall be required by Paragraph, SUBMITTALS. Construction work shall not start on any system until the layout drawings have been approved by VA.
4. Installer Qualifications: Installer shall be licensed and shall provide evidence of the successful completion of at least five projects of equal or greater size and complexity. Provide tradesmen skilled in the appropriate trade.
5. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or additional time to the Government.

G. Cleanliness of Piping and Equipment Systems:
   1. Care shall be exercised in the storage and handling of equipment and piping material to be incorporated in the work. Debris arising from cutting, threading, and welding of piping shall be removed.
   2. Piping systems shall be flushed, blown, or pigged as necessary to deliver clean systems.
   3. The interior of all tanks shall be cleaned prior to delivery and beneficial use by the Government. All piping shall be tested in accordance with the specifications and the International Plumbing Code (IPC). All filters, strainers, and fixture faucets shall be flushed of debris prior to final acceptance.
   4. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.
H. All material surfaces in contact with potable water shall comply with NSF 61.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protection of Equipment:
   1. Equipment and material placed on the job site shall remain in the custody of the Contractor until final acceptance, whether or not the Government has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
   2. Damaged equipment shall be replaced with an identical unit as determined and directed by the COR. Such replacement shall be at no additional cost or additional time to the Government.
   3. Interiors of new equipment and piping systems shall be protected against entry of foreign matter. Both inside and outside shall be cleaned before painting or placing equipment in operation.
   4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

1.7 AS-BUILT DOCUMENTATION

A. Submit manufacturer’s literature and data updated to include submittal review comments and any equipment substitutions.
B. Submit operation and maintenance data updated to include submittal review comments, substitutions and construction revisions shall be in electronic version on USB flash drive inserted into a three ring binder. All aspects of system operation and maintenance procedures, including applicable piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Notes on all special systems or devices shall be included. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished. Information explaining any special knowledge or tools the owner will be required to employ shall be inserted into the As-Built documentation.

C. The installing contractor shall maintain as-built drawings of each completed phase for verification; and, shall provide the complete set at the time of final systems certification testing. As-built drawings are to be provided, and a copy of them on Auto-Cad version 2020 or later provided on USB flash drive. Should the installing contractor engage the testing company to provide as-built or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement.

D. Certification documentation shall be provided to COR 10 working days prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and a certification that all results of tests were within limits specified.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated, 350 psi (2400 kPa).

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated, 350 psi (2400 kPa).

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Gaskets: AWWA C111, rubber.

C. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, round-grooved ends.

1. Grooved-End, Ductile-Iron Pipe Appurtenances: ASTM A47, malleable-iron castings or ASTM A536, ductile-iron castings with dimensions matching pipe, 350 psi (3400 kPa).
2. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions, Include ferrous housing sections, gasket suitable for water, and bolts and nuts.
3. Gaskets: AWWA C111.

D. Flanged Ductile Iron Pipe: AWWA C115/A21.11, with factory applied screwed long hub flanges.

1. Flanges: ASME B16.1 for // 125 psi (850 kPa) // or // 250 psi (1725 kPa) // pressure ratings, as necessary.
2. Wall Sleeve Castings, size and types shown on the drawings, shall be hot dipped galvanized per ASTM A123.
3. Pipe and fittings exposed to view in the finished work are to be painted in accordance with Section 09 91 00, PAINTING. Pipe shall be shop primed with one coat of rust inhibitive primer. Final paint color shall match the final wall color.

E. Cement Mortar Internal Lining: Cement mortar lining and bituminous seal coat as per AWWA C104.

F. Exterior Pipe Coating: The exterior of pipe shall have the standard asphaltic coating.

2.2 POLYVINYL CHLORIDE PIPE AND FITTINGS

A. Class-Rated Polyvinyl Chloride (PVC) Pipe: Pipe and accessories shall bear the NSF mark indicating pipe size, manufacturer's name, AWWA and/or ASTM Specification number, working pressure, and production code.

1. PVC pipe and accessories 100 mm to 355 mm (4 inches to 14 inches) in diameter, AWWA C900, Class 200, DR 14, cast iron outside diameters, unless otherwise shown or specified.
2. PVC Pipe and Accessories Smaller than 100 mm (4 inches): Schedule 80, meeting the requirements of ASTM D1785, Type 1, Grade 1. All exposed piping shall be CPVC meeting requirements of ASTM F441/F441M.

B. Joints:

1. Pipe 75 mm (3 inches) and Greater in Diameter: Push-on type with factory installed solid cross section elastomeric ring meeting the requirements of ASTM F477.
2. Pipe Less Than 75 mm (3 inches) in Diameter: Threaded (ASTM D2464) or solvent welded (ASTM D2672). Use Teflon tape or liquid Teflon thread lubricant approved for use on plastic on all threaded joints.

C. Fittings:

1. Class-Rated Pipe 75 mm (3 inches) in Diameter and Greater: Ductile iron with mechanical joints conforming to the requirements of AWWA C153. Mechanical joint fittings shall include retainer glands, unless otherwise noted.
2. For Schedule 80 Pipe less than 75 mm (3 inches) in Diameter: Threaded or solvent weld. Threaded PVC fittings shall conform to ASTM D2464. Solvent welded fittings shall conform to ASTM D2467. CPVC fittings shall conform to ASTM F437 for threaded fittings and ASTM F439 for solvent weld fittings.

2.3 MECHANICAL JOINT RETAINER GLANDS

A. Restraint devices for mechanical joint fittings and appurtenances conforming to either AWWA C111 or AWWA C153, shall conform to the following:

1. Restraint devices for nominal pipe sizes 75 mm (3 inch) through 900 mm (36 inch) shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of AWWA C110.
2. The devices shall have a working pressure rating equal to that of the pipe on which it is used. Ratings are for water pressure and must include a minimum safety factor of 2:1 in all sizes.

3. Gland body, wedges, and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536. Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 Brinell Hardness Number (BHN).
4. An identification number consisting of year, day, plant, and shift (YYDDD) (plant designation) (Shift number), shall be cast into each gland body. All physical and chemical test results shall be recorded such that they can be accessed via the identification number on the casting. All components shall be manufactured in the United States.
5. Mechanical Joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.
6. Mechanical joint restraints shall be listed by Underwriters Laboratories, and approved by Factory Mutual in the 75 mm (3 inch) through 300 mm (12 inch) sizes.
7. All casting bodies shall be surface pretreated with a phosphate wash, rinse, and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester-based powder to provide corrosion, impact, and UV resistance.

2.4 COPPER PIPE AND TUBING

A. Copper Piping: ASTM B88, Type K, or Type L with flared fittings in accordance with AWWA C800, with sweat cast brass fittings per ANSI B16.18. Use brazing alloy, AWS A5.8/A5.8M, Classification BCuP. Fittings for compression-type joint, ASME B16.26, flared tube type.

2.5 VALVES

A. Gate:
   1. Unless otherwise specified, valves shall conform to AWWA C509 with mechanical-joint ends. Valves 75 mm (3 inches) and greater shall be resilient seated, ductile iron body, bronze mounted inclined seats, non-rising stem type, turning counter-clockwise to open, with a minimum 1380 kPa (200 psi) WOG. The resilient seat shall be fastened to the gate with stainless steel fasteners or vulcanizing methods. The interior and exterior shall be coated with thermo-setting or fusion epoxy coating in accordance with AWWA C550. Stuffing boxes shall have 0-ring stem seals. Stuffing boxes shall be bolted and constructed so as to permit easy removal of parts for repair. Asbestos packing is prohibited.
   2. Operator:
      a. Underground: Except for use with post indicators, furnish valves with 50 mm (2 inch) nut for socket wrench operation.
      b. Above Ground and in Pits: Hand wheels.
   3. Joints: Ends of valves shall accommodate, or be adapted to, pipe installed.
B. Pressure Reducing Valves: Pressure reducing valves shall maintain a constant downstream pressure regardless of fluctuations in demand. Valves shall be suitable for 1000 kPa (150 psi) operating pressure on

the inlet side, with outlet pressure set for 600 kPa (85 psi). The valves shall be of the hydraulically-operated, pilot controlled, globe or angle type, and may be actuated either by diaphragm or piston. The pilot control shall be the diaphragm-operated, adjustable, spring-loaded type designed to permit flow when controlling pressure exceeds the spring setting. Ends shall be flanged. Valve bodies shall be bronze, cast iron, or cast steel with bronze trim. Valve stem shall be stainless steel. Valve discs and diaphragms shall be synthetic rubber. Valve seats shall be bronze. Pilot controls shall be bronze with stainless steel working parts.

2.6 TRACER WIRE FOR NONMETALLIC PIPING

A. Provide bare copper or aluminum wire not less than 2.5 mm (0.10 inch) in diameter in sufficient length to be continuous over each separate run of nonmetallic pipe.

2.7 WARNING TAPE

A. Standard, 0.10 mm (4-mil) polyethylene 75 mm (3 inch) wide tape, detectable type, blue with black letters, and imprinted with “CAUTION BURIED WATER LINE BELOW”.

2.8 LOCATOR EQUIPMENT

A. Provide location equipment (device and appurtenances) suitable for locating tracer wire and/or detectable warning tape placed above water utility lines at the actual depths for this project. The locator device shall be capable of locating the detectable warning tape from above the tape without making physical contact with the detectable warning tape. Before acceptance, the equipment shall be demonstrated at various locations and conditions for the project to confirm the functionality for its intended purpose.

2.9 VALVE BOX

A. Cast iron extension box with screw or slide-type adjustment and flared base. Minimum thickness of metal shall be 5 mm (3/16 inch). Box shall be adapted, without full extension, to depth of cover required over pipe at valve location. Cast the word "WATER" in cover. Provide two "T" handle socket wrenches of 18 mm (5/8 inch) round stock long enough to extend 600 mm (2 feet) above top of deepest valve box. The least diameter of the shaft of the box shall be 135 mm (5-1/4 inches). Cast iron box shall have a heavy coat of bituminous paint. Valve box and cover shall be installed where indicated on the drawings to be utilized as access points for the tracer wire or detectable warning tape.

2.10 PIPE SLEEVES

A. Cast gray ductile iron or zinc coated steel.

2.11 SLEEVE-TYPE MECHANICAL COUPLINGS

A. Couplings shall be designed to couple plain-end piping by compression of a ring gasket at each end of the adjoining pipe sections. The coupling shall consist of one middle ring flared or beveled at each end to provide a gasket seat; two follower rings; two resilient tapered rubber gaskets; and bolts and nuts to draw the follower rings toward each other to compress the gaskets. The middle ring and the follower rings shall be true circular sections free from irregularities, flat spots, and surface defects; the design shall provide for confinement and compression of the gaskets. For PVC plastic pipe, the middle ring shall be of cast iron or steel; and the follower rings shall be of malleable or ductile iron. Malleable and ductile iron shall conform to ASTM A47/A47M and ASTM A536, respectively. Steel shall have a strength not less than that of the pipe. Gaskets shall be designed for resistance to set after installation and shall meet the applicable requirements specified for gaskets for mechanical joint in AWWA C111. Bolts shall be track-head type, ASTM A307, Grade A, with nuts, ASTM A563, Grade A; or round-head square-neck type bolts, ASME B18.5.2.1Mor with hex nuts, ASME B18.2.2. Bolts shall be 18 mm (5/8 inch) in diameter; minimum number of bolts for each coupling shall be 3 for 150 mm (6inch) pipe. Bolt holes in follower rings shall be of a shape to hold fast the necks of the bolts used. Mechanically coupled joints using a sleeve-type mechanical coupling shall not be used as an optional method of jointing except where pipeline is adequately anchored to resist tension pull across the joint. Mechanical couplings shall provide a tight flexible joint under all reasonable conditions, such as pipe movements caused by expansion, contraction, slight setting or shifting in the ground, minor variations in trench gradients, and traffic vibrations. Couplings shall be of strength not less than the adjoining pipeline.

2.12 BACKFLOW PREVENTER

A. Potable Water and Irrigation Water Service: Reduced Pressure Principle Type AWWA C511, except pressure drop at rated flow shall not exceed 103 kPa (15 psi). Gate valves installed on the assembly shall be resilient seated valve conforming to AWWA C509.

B. Fire Service: Double detector check valve. AWWA C510 and NFPA 24.

C. In cold climate areas, backflow assemblies and devices shall be protected from freezing by a method acceptable to local jurisdiction.

D. Backflow preventers shall be approved by the Foundation for Cross Connection Control and Hydraulic Research (USC FCCCHR) of the Manual of Cross-Connection Control.

E. Backflow preventer shall not be located in any area containing fumes that are toxic, poisonous, or corrosive.

F. Direct connections between potable water piping and sewer connected wastes shall not exist under any condition with or without backflow protection.

G. Backflow preventer shall be accessed and have clearance for the required testing, maintenance, and repair. Access and clearance shall require a minimum of 300 mm (1 foot) between the lowest portion of the

assembly and grade, floor, or platform. Installations elevated more than 1500 mm (5 feet) above the floor or grade shall be provided with a permanent platform capable of supporting a tester or maintenance person.

2.13 WATER METER

A. Furnished and set by Contractor for use by Owner. Meter shall be a:
   1. Compound Type Meters: Shall conform to AWWA C702/and shall be furnished with strainers. The main casing shall be cast iron protected by corrosion resistant coating with stainless steel external fasteners. The main casing shall be tapped for field testing purposes. Registers shall be straight-reading type, shall be permanently sealed and shall read in (U.S. gallons). The meter shall be equipped with a coordinating register. Connections shall be suitable to the type of pipe and conditions encountered. Register type shall be a direct reading remote register designed in accordance with AWWA C706 or an encoder type remote register designed in accordance with AWWA C707. Register type to be conformed with the Augusta Utilities Department. Meters shall comply with the accuracy and capacity requirements of AWWA C702.
B. Furnish and install meter approved by Augusta Utilities Department. Forward approval.

2.14 CONCRETE VAULTS

A. Precast, reinforced-concrete vault: ASTM C858, designed for AASHTO HS20-44 load designation.
   1. Ladder: ASTM A36/A36M, steel or polyethylene-encased steel steps.
   2. Drain: ASME A112.6.3, cast iron floor drain with outlet. Include body anchor flange, light-duty cast iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.
   3. Vault Frame and Cover: HS20 load rated, ¼ inch diamond plated aluminum hatch, 900 mm (36 inch) minimum square, unless otherwise indicated.

2.15 CAST IRON FRAME AND COVER, STEPS, ETC.

A. Frames and Covers: Shall be cast iron or ductile iron. Cast iron frames and covers shall be as indicated or shall be of type suitable for the application, circular, without vent holes. The frames and covers shall have a combined weight of not less than 181 Kg (400 lbs.). The word "WATER" shall be stamped or cast into covers so that it is plainly visible.
B. Manhole Steps: Plastic or rubber coated, pressure-molded to the steel. Plastic coating shall conform to ASTM D4101, copolymer polypropylene. Rubber shall conform to ASTM C443, except shore A durometer hardness shall be 70 plus or minus 5. Aluminum steps or rungs are prohibited.

2.16 POTABLE WATER

A. Water used for filling, flushing, and disinfection of water mains and appurtenances shall conform to Safe Drinking Water Act.

2.17 DISINFECTION CHLORINE

A. Liquid chlorine shall conform to AWWA B301 and AWWA C651.

B. Sodium hypochlorite shall conform to AWWA B300 with 5 percent to 15 percent available chlorine.

C. Calcium hypochlorite shall conform to AWWA B300 supplied in granular form or 5 gram tablets, and shall contain 65 percent chlorine by weight.

2.18 LINK/SLEEVE SEALS - NOT USED

PART 3 - EXECUTION

3.1 INSTALLATION

A. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.

3.2 BUILDING SERVICE LINES

A. Install water service lines to point of connection within approximately 1500 mm (5 feet) outside of buildings to which such service is to be connected and make connections thereto. If building services have not been installed, provide temporary caps.

3.3 REGRADING

A. Raise or lower existing valve and curb stop boxes, or any other applicable water system facilities, to finish grade in areas being graded.

3.4 PIPE LAYING, GENERAL

A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as recommended by the manufacturer in order to maintain the product performance as if it were undamaged.

B. All pipe and fittings shall be inspected just prior to being laid or installed. If any defective piping is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional cost or time to the Government. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid, shall conform to the lines and grades required.

C. All buried piping shall be installed to the lines and grades as shown on the drawings. All underground piping shall slope uniformly between joints where elevations are shown. If elevations are not indicated, pipe shall have a minimum depth of cover of 1.2 m (4 feet).

D. Exercise extreme care when installing piping to shore up and protect from damage all existing utilities and structures.

E. Do not lay pipe on unstable material, in wet trench, or when trench or weather conditions are unsuitable.

F. Do not lay pipe in same trench with other pipes or utilities unless shown otherwise on drawings.

G. Hold pipe securely in place while joint is being made.

H. Do not walk on pipes in trenches until covered by layers of earth compacted in place to a depth of at least 300 mm (12 inches) over pipe.

I. Full length of each section of pipe shall rest solidly upon pipe bed with recesses excavated to accommodate bells or joints. Do not lay pipes on wood blocking.

J. Tees, plugs, caps, bends, and hydrants installed on underground pipe shall be anchored. See paragraph PIPE SUPPORTS.

K. Close pipe openings with caps or plugs during installation. Tightly cover and protect equipment against dirt, water, and chemical, or mechanical injury. At completion of all work, thoroughly clean exposed materials and equipment.

L. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by the manufacturer.

M. Warning tape shall be continuously placed 300 mm (12 inches) below finish grade above buried water pipes, or at bottom of subbase where roadways exist, whichever is deeper with overall depth not exceeding 600 mm (24 inches). Detectable warning tape shall be locatable by the NCA staff from the finish grade above the pipe, utilizing existing locating equipment, or the approved locator equipment provided by the Contractor to the Owner (NCA Staff) as specified in paragraph LOCATOR EQUIPMENT.

N. Trench excavation and compaction of backfill shall comply with the requirements of Section 31 20 00, EARTH MOVING.

3.5 DUCTILE IRON PIPE

A. Installing Pipe: Lay pipe in accordance with AWWA C600 with polyethylene encasement, if required, in accordance with AWWA C105. Provide a firm even bearing throughout the length of the pipe by tamping selected material at the sides of the pipe up to the spring line.

B. All pipe shall be sound and clean before laying. When laying is not in progress, the open ends of the pipe shall be closed by watertight plug or other approved means.

C. When cutting pipe is required, the cutting shall be done by an appropriate industry standard method,leaving a smooth cut at right angles to the axis of the pipe. Bevel cut ends of pipe to be used with push-on bell in order to conform to the manufactured spigot end. Cement lining shall be undamaged or perform cutting following manufacturer’s recommendations for field cutting of pipe.

D. Jointing Ductile-Iron Pipe:

1. Push-on joints shall be made in strict accordance with the manufacturer’s instruction. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe is to be aligned with the

bell of the pipe to which it is joined, and pushed home following industry standard procedures or manufacturer's approved means.

2. Mechanical Joints at Valves, Fittings: Install in strict accordance with AWWA C111. To assemble the joints in the field, thoroughly clean the joint surfaces and rubber gaskets with soapy water before tightening the bolts. Bolts shall be tightened to the specified torque. For new construction, all mechanical joints at valves and fittings shall be secured with an approved mechanical joint retainer glands suitable for the pipe.
3. Ball Joints: Install in strict accordance with the manufacturer's instructions. Where ball joint assemblies occur at the face of structures, the socket end shall be at the structure and ball end assembled to the socket.
4. Flanged joints shall be in accordance with AWWA C115. Flanged joints shall be fitted so that the contact faces bear uniformly on the gasket and then are made up with relatively uniform bolt stress.

3.6 PVC PIPE

A. PVC piping shall be installed in strict accordance with the manufacturer's instructions and AWWA C605. Place selected material and thoroughly compacted to one foot above the top of the pipe and thereafter back filled as specified in Section 31 20 00, EARTH MOVING.

B. Copper Tracer Wire: Copper tracer wire consisting of No. 14 AWG solid, single conductor, insulated copper wire shall be installed in the trench with all piping to permit location of the pipe with electronic detectors. The wire shall not be spiraled around the pipe nor taped to the pipe. Wire connections are to be made by stripping the insulation from the wire and soldering with rosin core solder. Solder joints shall be wrapped with rubber tape and electrical tape. At least every 300 m (984 feet), provide a 2.3 kg (5 pound) magnesium anode attached to the main tracer wire by solder. The solder joint shall be wrapped with rubber tape and with electrical tape. An anode shall be attached at the end of each line.

3.7 TRACER SYSTEM INSTALLATION

A. Install with all buried water main piping.

B. Begin and terminate system at all connections to existing mains.

C. Install wire continuously along the lower quadrant of the pipe. Do not install wire along the bottom of the pipe. Attach wire to the pipe at the midpoint of each pipe length; use 50 mm (2 inch) wide, 0.25 mm (10 mil) thickness polyethylene pressure sensitive tape.

D. Install splices only as authorized by the COR. Allow the COR to inspect all below-grade splices of tracer wire prior to backfill.

E. Install ground rods adjacent to connections to existing piping and at locations specified in the contract documents or as directed by the COR.

F. Bring two wires to the surface at each hydrant designated location within a valve box and cover and terminate with an accessible tracer wire termination.

G. Final inspection of the tracer system will be conducted at the completion of the project and prior to acceptance by the owner. Verify the electrical continuity of the system. Repair any discontinuities.

3.8 COPPER PIPE

A. Copper piping shall be installed in accordance with the Copper Development Association's Copper Tube Handbook and manufacturer's recommendations. Copper piping shall be bedded in 150 mm (6 inches) of sand and then back filled as specified in Section 31 20 00, EARTH MOVING.

3.9 PIPE SUPPORTS

A. All piping shall be properly and adequately supported. Hangers, supports, base elbows, tees, and concrete piers and pads shall be provided as indicated on the drawings. If the method of support is not indicated on the drawings, exposed piping shall be supported by hangers wherever the structure is suitable and adequate to carry the superimposed load. Supports shall be placed approximately 2.4 m (8 feet) on center and at each fitting.

B. Hangers shall be heavy malleable iron of the adjustable swivel type, split ring type, or the adjustable-swivel, pipe-roll type for horizontal piping and adjustable, wrought iron, clamp type for vertical piping. Flat steel strap or chain hangers are not acceptable unless indicated on the drawings.

C. Hangers shall be attached to the structure, where possible, by beam clamps and approved concrete inserts set in the forms before concrete is poured. Where this method is impractical, anchor bolts with expanding lead shields, rawl drives, or malleable iron expansion shields will be permitted.

D. Where hangers cannot be used, provide pipe saddle supports with pipe column and floor flange.

3.10 RESTRAINED JOINTS

A. Sections of piping requiring restrained joints shall be constructed using pipe and fittings with restrained "locked-type" joints and the joints shall be capable of holding against withdrawal for line pressures 50 percent above the normal working pressure but not less than 1380 kPa (200 psi). The pipe and fittings shall be restrained push-on joints or restrained mechanical joints.

B. The minimum number of restrained joints required for resisting force at fittings and changes in direction of pipe shall be determined from the length of retained pipe on each side of fittings and changes in direction necessary to develop adequate resisting friction with the soil. Restrained pipe length shall be as shown on the drawings.

C. Restrained joint assemblies with ductile iron mechanical joint pipe shall be as specified herein in paragraph MECHANICAL JOINT RETAINER GLANDS or approved equal.

D. Thrust blocks shall be required, unless otherwise noted.

E. Where ductile iron pipe manufactured with restrained joints is utilized, all restrained joints shall be fully extended and engaged prior to back filling the trench and pressurizing the pipe.

F. Ductile iron mechanical joint fittings used with PVC pipe shall be restrained with the specified Mechanical Joint Restrainer Gland, or approved equal.

3.11 PIPE SEPARATION

A. Horizontal Separation-Water Mains and Sewers:
   1. Water mains shall be located at least 3 m (10 feet) horizontally from any proposed drain, storm sewer, sanitary, or sewer service connection.
   2. Water mains may be located closer than 3 m (10 feet) to a sewer line when:
      a. Local conditions prevent a lateral separation of 3 m (10 feet); and
      b. The water main invert is at least 457 mm (18 inches) above the crown of the sewer; and
      c. The water main is either in a separate trench or in the same trench on an undisturbed earth shelf located one side of the sewer.
   3. When it is impossible to meet (1) or (2) above, both the water main and drain or sewer shall be constructed of mechanical joint ductile iron pipe. Ductile iron pipe shall comply with the requirements listed in this specification section. The drain or sewer shall be pressure tested to the maximum expected surcharge head before back filling.

B. Vertical Separation-Water Mains and Sewers:
   1. A water main shall be separated from a sewer so that its invert is a minimum of 457 mm (18 inches) above the crown of the drain or sewer whenever water mains cross storm sewers, sanitary sewers, or sewer service connections. The vertical separation shall be maintained for that portion of the wear main located within 3 m (10 feet) horizontally of any sewer or drain crossed. A length of water main pipe shall be centered over the sewer to be crossed with joints equidistant from the sewer or drain.
   2. Both the water main and sewer shall be constructed of slip-on or mechanical joint ductile iron pipe or PVC pipe equivalent to water main standards of construction when:
      a. It is impossible to obtain the proper vertical separations described in (1) above; or
      b. The water main passes under a sewer or drain.
   3. A vertical separation of 457 mm (18 inches) between the invert of the sewer or drain and the crown of the water main shall be maintained where a water main crosses under a sewer. Support the sewer or drain lines to prevent settling and breaking the water main.
   4. Construction shall extend on each side of the crossing until the perpendicular distance from the water main to the sewer or drain line is at least 3 m (10 feet).

3.12 SETTING OF VALVES AND BOXES

A. Provide a surface concrete pad 457 by 457 by 150 mm (18 by 18 by 6 inches) to protect valve box when valve is not located below pavement.

B. Clean valve and curb stops interior before installation.

C. Set valve and curb stop box cover flush with finished grade.

D. Set curb stop box and cover for access to identification wire and/or detectable warning tape with a 300 by 300 by 75 mm (12 by 12 by 3 inches) at approximately the depth of the warning tape and bring the tape and/or identification wire into the box and coil extra length sufficient to allow the tape or wire to be uncoiled and extended 1500 mm (5 feet) above finish grade at the location.

E. Valves shall be installed plumb and level and in accordance with manufacturer's recommendations.

3.13 SETTING OF FIRE HYDRANTS

A. Set center of each hydrant not less than 600 mm (2 feet) nor more than 1829 mm (6 feet) back of edge of road or face of curb. Fire apparatus connection shall face road with center of nozzle 457 mm (18 inches) above finished grade. Set barrel flange not more than 50 mm (2 inches) above finished grade.

B. Set each hydrant on a slab of stone or concrete not less than 100 mm (4 inches) thick and 381 mm (15 inches) square. The service line to the hydrant, between the tee and the shoe of the hydrant, shall be fully restrained.

C. Set bases in not less than 0.4 cubic meter (1/2 cubic yard) of crushed rock or gravel placed entirely below hydrant drainage device.

D. Clean interiors of hydrants of all foreign matter before installation.

3.14 PIPE SLEEVES

A. Install where water lines pass through retaining walls, building foundations, and floors. Seal with modular mechanical type link seal. Install piping so that no joint occurs within a sleeve. Split sleeves may be installed where existing lines pass through new construction.

3.15 HYDROSTATIC TESTING

A. Hydrostatic testing of the system shall occur prior to disinfecting the system.

B. After new system is installed, except for connections to existing system and building, backfill at least 300 mm (12 inches) above pipe barrel, leaving joints exposed. The depth of the backfill shall be adequate to prevent the horizontal and vertical movement of the pipe during testing.

C. Prior to pressurizing the line, all joint restraints shall be completely installed and inspected.

D. If the system is tested in sections, and at the temporary caps at connections to the existing system and buildings, provide and install all required temporary thrust restraints required to safely conduct the test.

E. Install corporation stops in the line as required to purge the air out of the system. At the completion of the test, all corporation stops shall be capped.

F. Perform pressure and leakage tests for the new system for 2 hours to 1380 kPa (200 psi). Leakage shall not exceed the following requirements.

1. Copper Tubing: No leaks.
2. Ductile Iron Pipe: AWWA C600. Provide to COR office.
3. Polyvinyl Chloride (PVC) AWWA C605. Provide to COR office.

3.16 FLUSHING AND DISINFECTING

A. Flush and disinfect new water lines in accordance with AWWA C651.

B. Initial flushing shall obtain a minimum velocity in the main of 0.75 m/s (2.5 f/s) at 276 kPa (40 psi) residual pressure in water main. The duration of the flushing shall be adequate to remove all particles from the line.

Pipe Diameter		Flow Required to Produce 76 cm/sec (2.5 ft/sec)(approx.) Velocity in Main		Number of Hydrant Outlets			
				Size of Tap. mm (in.)			
				25(1)	38(1 1/2)	51(2)	64(2 1/2)
mm	(In)	L/sec	(gpm)	Number of taps on pipe			
100	(4)	6.3	(100)	1	--	--	1
150	(6)	12.6	(200)	--	1	--	1
200	(8)	25.2	(400)	--	2	1	1
250	(10)	37.9	(600)	--	3	2	1
300	(12)	56.8	(900)	--	--	3	2
400	(16)	100.9	(1600)	--	--	4	2

Note: The backflow preventers shall not be in place during the flushing.

C. Provide the water source for filling, flushing, and disinfecting the lines; only potable water shall be used. Provide all required temporary pumps, storage facilities required to complete the specified flushing, and disinfection operations.

D. Dispose of all water used to flush and disinfect the system in accordance with all governing rules and regulations. The discharge water shall not be allowed to create a nuisance for activities occurring on or adjacent to the site.

E. The bacteriological test specified in AWWA C651 shall be performed by a laboratory approved by the Georgia Environmental Protection Division. The cost of sampling, transportation, and testing shall be the responsibility of the Contractor.

F. Re-disinfection and bacteriological testing of failed sections of the system shall be the sole responsibility of the Contractor.

G. Before backflow preventers are installed, all upstream piping shall be thoroughly flushed.

3.17 BACKFLOW PREVENTOR TESTING

A. All backflow preventers shall be installed, tested, and certified for proper operation prior to being placed in operation.

B. Original copies of the certification shall be submitted to the COR and the Augusta Utilities Department.

3.18 STARTUP AND TESTING

A. Make tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.

B. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government.

C. The Commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the COR and Commissioning Agent. Provide a minimum notice of 10 working days prior to startup and testing.

3.19 COMMISSIONING

A. Provide commissioning documentation in accordance with the requirements of Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.

B. Components provided under this section of the specification will be tested as part of a larger system.

3.20 DEMONSTRATION AND TRAINING

A. Provide services of manufacturer’s technical representative for four hours to instruct each VA personnel responsible in the operation and maintenance of units.

B. Submit training plans and instructor qualifications in accordance with the requirements of Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.

END OF SECTION

SECTION 33 30 00
SANITARY SEWER UTILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies materials and procedures for construction of outside, underground sanitary sewer systems that are complete and ready for operation. This includes piping, structures and all other incidentals.

1.2 RELATED WORK

A. Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing: Section 31 20 00, EARTH MOVING.

B. General plumbing, protection of Materials and Equipment, and quality assurance: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

C. Fabrication of Steel Ladders: Section 05 50 00, METAL FABRICATION.

D. Submittals: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

E. Erosion and Sediment Control: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

1.3 DEFINITIONS

1.4 ABBREVIATIONS

A. PVC: Polyvinyl chloride plastic

B. DI: Ductile iron pipe

1.5 DELIVERY, STORAGE AND HANDLING

A. Store plastic piping protected from direct sunlight and support to prevent sagging and bending. Protect stored piping from moisture and dirt by elevating above grade. Protect flanges, fittings, and specialties from moisture and dirt.

B. Handle manholes according to manufacturer's written rigging instructions.

1.6 COORDINATION

A. Coordinate connection to the on-site septic system with the Richmond County Health Department. (Approval from the Richmond County Health Department has been obtained.)

B. Coordinate exterior utility lines and connections to building lines up to 5 feet of building wall.

C. Coordinate connection to on-site septic system with the Richmond County Health Department.

1.7 QUALITY ASSURANCE:

A. Products Criteria:

1. When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.
2. A nameplate bearing manufacturer's name or trademark, including model number, shall be securely affixed in a conspicuous place on equipment. In addition, the model number shall be either cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.

B. Comply with the rules and regulations of the Public Utility having jurisdiction over the connection to Public Sanitary Sewer lines and the extension, and/or modifications to Public Utility Systems.

1.8 SUBMITTALS:

A. Manufacturers' Literature and Data shall be submitted for the following as one package:

1. Pipe, Fittings, and Appurtenances.
2. Jointing Material.
3. Manhole and Structure Material.
4. Frames and Covers.
5. Steps and Ladders.

1.9 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society for Testing and Materials (ASTM):

A185/A185M-07 .....Steel Welded Wire Reinforcement, Plain, for Concrete

A615/A615M-09b .....Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

A746-99.....Ductile-Iron Gravity Sewer Pipe

C478-09.....Precast Reinforced Concrete Manhole Sections

C857-11.....Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

C890-11.....Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures

C913-08.....Precast Concrete Water and Wastewater Structures

C923-08.....Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals

C1173-10.....Flexible Transition Couplings for Underground Piping Systems

C1440-08.....Thermoplastic Elastomeric (TPE) Gasket Materials for Drain, Waste and Vent (DWV), Sewer, Sanitary and Storm Plumbing Systems

C1460-08.....Shielded Transition Couplings for Use With Dissimilar DWV Pipe and Fittings Above Ground

C1461-08.....Mechanical Couplings Using Thermoplastic Elastomeric (TPE) Gaskets for Joining Drain, Waste and Vent (DWV), Sewer, Sanitary and Storm Plumbing systems for Above and below Ground Use

D2321-11.....Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

D3034-08.....Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

F477-10 .....Elastomeric Seals (Gaskets) for Joining Plastic Pipe

F679-08 .....Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

F891-10 .....Coextruded Poly(vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core

F949-10 .....Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings

F1668-08 .....Construction Procedures for Buried Plastic Pipe

C. American Water Works Association (AWWA):

C105/A21.5-10.....Polyethylene Encasement for Ductile-Iron Pipe Systems

C110-08.....Ductile-Iron and Gray-Iron Fittings

C111/A21.11-06.....Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings

C151/A21.51-09.....Ductile Iron Pipe, Centrifugally Cast

C153/A21.53-06.....Ductile Iron Compact Fittings for Water Service

C219-11.....Bolted, Sleeve-Type Couplings for Plain-End Pipe

C600-10.....Installation of Ductile-Iron Mains and Their Appurtenances

C900-07.....Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution

D. American Society of Mechanical Engineers:

A112.36.2M-1991 .....Cleanouts

1.10 WARRANTY

A. The Contractor shall remedy any defect due to faulty material or workmanship and pay for any damage to other work resulting therefrom within a period of one year from final acceptance. Further, the Contractor will provide all manufacturers' and supplier's written guarantees and warranties covering materials and equipment furnished under this Contract.

PART 2 - PRODUCTS

2.1 FACTORY-ASSEMBLED PRODUCTS

A. Standardization of components shall be maximized to reduce spare part requirements.

B. The Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

2.2 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical Joint Piping

1. Pipe and Fittings: AWWA C151, SDR 35 unless otherwise shown or specified.
2. Compact Fittings: AWWA C153.
3. Gaskets: AWWA C111.
4. Exterior coating: AWWA C151.
5. Interior lining shall be as per ASTM A746.
6. Pipe and fittings shall be polyethylene encased as per AWWA C105.

B. Push-on-Joint Piping:

1. Pipe: AWWA C151, thickness // insert class // , with bolt holes in bell.
2. Standard Fittings: AWWA C110.
3. Compact Fittings: AWWA C153.
4. Gaskets: AWWA C111.
5. Exterior coating: AWWA C151.
6. Interior lining: AWWA C151.
7. Pipe and fittings shall be polyethylene encased as per AWWA C105.

2.3 PVC, GRAVITY SEWER PIPE AND FITTINGS

A. PVC Gravity Sewer Piping:

1. Pipe and Fittings shall conform to ASTM D3034, SDR 35
2. Gaskets: ASTM F477.

B. PVC Cellular-Core Sewer Piping – NOT USED

C. PVC Corrugated Sewer Piping – NOT USED

D. PVC Type PSM Sewer Piping – NOT USED

2.4 PVC, PRESSURE PIPE AND FITTINGS – NOT USED

2.5 GRAVITY FLOW LINES WITH SECONDARY CONTAINMENT (ENCASEMENT) – NOT USED

2.6 PVC PRESSURE (FORCE) MAIN – NOT USED

2.7 NONPRESSURE-TYPE TRANSITION COUPLINGS

A. Comply with ASTM C1173, elastomeric, sleeve type, reducing or transition coupling, for joining underground nonpressure piping. Include ends to match same sizes of main line piping and install corrosion-resistant metal tension bands and tightening mechanism on each end.

B. Sleeve Materials:

1. For Plastic Pipes: ASTM F477, elastomeric seal.
2. For Dissimilar Pipes: PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Couplings shall be elastomeric sleeve with //stainless steel shear ring and // corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

1. Couplings shall meet ASTM C1460 with // elastomeric // or // rubber sleeve // with full-length, corrosion-resistant outer shield with corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Couplings shall be elastomeric compression seal with dimensions to fit inside bell of larger mainline pipe and for spigot of smaller main line pipe to fit inside ring.

F. Nonpressure-Type, Rigid Couplings:

1. Coupling shall be ASTM C1461, // sleeve-type, reducing- // or // transition-type mechanical coupling //, molded from ASTM C1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.8 PRESSURE-TYPE PIPE COUPLINGS – NOT USED

2.9 EXPANSION JOINTS AND DEFLECTION FITTINGS – NOT USED

2.10 BACKWATER VALVES – NOT USED

2.11 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Cleanouts shall be as per ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Valve loadings shall be designed for Medium Duty.
3. Cleanout Riser: Sewer pipe fitting on main line pipe and riser shall be as per ASTM A74, service class.

B. PVC Cleanouts:

1. PVC body with PVC threaded plug: Cleanout shall be as per ASTM D3034. PVC sewer pipe fitting and riser to cleanout.
2. Cleanout Riser: Sewer pipe fitting on main line sewer and riser shall match main line piping.

2.12 MANHOLES – NOT USED

2.13 CONCRETE

A. Cast-in-place concrete shall be 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.

B. Reinforcement

1. Reinforcing fabric shall be ASTM A185, steel, welded wire fabric, plain.
2. Reinforcing bars shall be ASTM A615, Grade 60 (420 MPa) deformed steel.

C. Benches shall be concrete, sloped to drain into the channel. Provide 6 inches (150 mm) from the cut section of top of pipe to edge of manhole.

D. Ballast and Pipe Supports shall be Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.

2.14 WET WELL – NOT USED

2.15 ACID NEUTRALIZATION TANKS – NOT USED

2.16 OIL AND GREASE INTERCEPTOR AND GREASE REMOVAL PIT

A. Pit shall be constructed of reinforced precast concrete or cast-in-place concrete of the shape and configuration indicated on the plans. Precast vaults shall be constructed in accordance with ASTM C857 and be rated for AASHTO HS20-44 loading. The concrete shall have a minimum compressive strength of 5000 psi (35 MPa) at 28 days, and reinforcement shall comply with ASTM A615, Grade 60. Access to the pit shall be through 24 inches (600 mm) diameter manhole frame and cover or through hinged aluminum access manways.

B. Baffles shall be constructed of 1/4 inch (6 mm) mild carbon steel with 1/4 inch (6 mm) thermoplastic coating.

2.17 AIR RELEASE VALVE FOR FORCE MAINS – NOT USED

2.18 WARNING TAPE

A. Warning tape shall be standard, 4 mil (0.1 mm) polyethylene 3 inch (76 mm) wide tape non-detectable type, green with black letters and imprinted with “CAUTION BURIED SEWER LINE BELOW”.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans and details indicate the general location and arrangement of underground sanitary sewer piping. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at the low point, true to grades and alignment indicated on the drawings, with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Do not lay pipe on unstable material, in wet trench or when trench and weather conditions are unsuitable for the work.

D. Support pipe on compacted bedding material. Excavate bell holes only large enough to properly make the joint.

E. Inspect pipes and fittings for defects before installation. Defective materials shall be plainly marked and removed from the site. Cut pipe shall have smooth regular ends at right angles to axis of pipe.

F. Lower pipe into trench carefully and bring to proper line, grade, and joint. After jointing, interior of each pipe shall be thoroughly wiped or swabbed to remove any dirt, trash or excess jointing materials.

G. Do not walk on pipe in trenches until covered by layers of bedding or backfill material to a depth of 12 inches (300 mm) over the crown of the pipe.

H. Warning tape shall be continuously placed 12 inches (300 mm) above sewer pipe

I. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

J. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

K. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process or microtunneling.

L. Install gravity-flow, non-pressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent unless otherwise indicated.
2. Install piping with 48 inch (1220 mm) minimum cover as shown on Drawings.
3. Install ductile iron, gravity sewer piping according to AWWA C600.

4. Install PVC cellular-core, PVC corrugated sewer, PSM sewer and PVC gravity sewer according to ASTM D2321 and ASTM F1668.

M. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.2 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, non-pressure, drainage piping according to the following:

1. Join ductile iron, gravity sewer piping according to AWWA C600 for push-on joints.
2. Join PVC piping according to ASTM D2321.
3. Join dissimilar pipe materials with nonpressure-type, // flexible // or rigid // couplings.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use non-pressure flexible couplings where required to join gravity-flow, non-pressure sewer piping unless otherwise indicated.
   a. Unshielded Rigid couplings for pipes of same or slightly different OD.
   b. Unshielded, increaser/reducer-pattern, rigid couplings for pipes with different OD.
   c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
2. Use pressure pipe couplings for force-main joints.

3.3 SEWER AND MANHOLE SUPPORTS, CONCRETE CRADLES WITHIN VAULTS – NOT USED

3.4 BUILDING SERVICE LINES

A. Install sanitary sewer service lines to point of connection within approximately 5 feet (1500 mm) outside of building(s) where service is required and make connections. Coordinate the invert and location of the service line with the Contractor installing the building lines.

3.5 MANHOLE INSTALLATION – NOT USED

3.6 WET WELLS – NOT USED

3.7 OIL AND GREASE INTERCEPTOR AND GREASE REMOVAL PIT

A. Pipe and fittings shall be PVC piping and shall be used inside of trap, between trap and buildings, and between trap and manhole.

B. Manways and access manholes shall be set to finish grade providing adequate access to the unit. Slope pavement around the access-way to prevent stormwater from entering the unit.

C. Install baffles as indicated on the drawings.

3.8 ACID NEUTRALIZING TANKS – NOT USED

3.9 BACKWATER VALVE INSTALLATION – NOT USED

3.10 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Cleanouts should be 6 inches (150 mm) in diameter and consist of a ductile iron 45 degree fitting on end of run, or combination Y fitting and l/8 bend in the run with ductile iron pipe extension, water tight plug or cap and cast frame and cover flush with finished grade. Install piping so cleanouts open in direction of flow in sewer pipe.
   1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
   2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
   3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
   4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place-concrete, 18 by 18 by 12 inches (450 by 450 by 300 mm) 1 inch (25 mm) above surrounding grade.

C. Where cleanout is in force main, provide a blind flange top connection. The center of the flange shall be equipped with a 2 inches (50 mm) base valve to allow the pressure in the line to be relieved prior to removal of the blind flange. Frames and covers for pressure (force) mains shall be 24 inches (600 mm) in diameter.

D. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

E. The top of the cleanout assembly shall be 2 inches (50 mm) below the bottom of the cover to prevent loads being transferred from the frame and cover to the piping.

3.11 CONNECTIONS

A. Make connections to existing piping and underground structures by coring and installing the pipe at the design invert. Install an elastomeric gasket around the pipe, and grout the interstitial space between the pipe and the core.

B. Use commercially manufactured wye fittings for piping branch connections. Encase entire wye fitting plus 6-inch (150-mm) overlap with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
   1. Make branch connections from the side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500), by removing a section of the existing pipe.
   2. Make branch connections from the side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes by cutting an opening into existing unit large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On

outside of pipe or manhole wall, encase entering connection in concrete to provide additional support of collar from connection to undisturbed ground.

3. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.12 AIR RELEASE VALVES – NOT USED

3.13 REGRADING

A. Raise or lower existing manholes and structures frames and covers, cleanout frames and covers and valve boxes in regraded areas to finish grade. Carefully remove, clean and salvage cast iron frames and covers. Adjust the elevation of the top of the manhole or structure as detailed on the drawings. Adjust the elevation of the cleanout pipe riser, and reinstall the cap or plug. Reset cast iron frame and cover, grouting below and around the frame. Install concrete collar around reset frame and cover as specified for new construction.

B. During periods when work is progressing on adjusting manholes or structures cover elevations, the Contractor shall install a temporary cover above the bench of the structure or manhole. The temporary cover shall be installed above the high flow elevation within the structure, and shall prevent debris from entering the wastewater stream.

3.14 CLOSING ABANDONED SANITARY SEWER SYSTEMS

A. Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed.

1. Piping under and within 5 feet (1500 mm) of building areas shall be completely removed.
2. Piping outside of building areas shall // be completely removed // plugged with concrete, and abandoned in-place //.

B. Excavate around manholes as required and use either procedure below:

1. Manholes and structures outside of building areas: Remove frame and cover, cut and remove the top of an elevation of 2 feet (600 mm) below finished grade. Fill the remaining portion with compacted gravel or crushed rock or concrete.
2. Manholes and structures with building areas: Remove frame and cover and remove the entire structure and the base.

C. Backfill to grade according to Division 31 Section 31 20 00, EARTH MOVING.

D. When the limit of the abandonment terminates in an existing manhole to remain, the flow line in the bench of the manhole to the abandoned line shall be filled with concrete and shaped to maintain the flowline of the lines to remain.

3.15 PIPE SEPARATION

A. Horizontal Separation - Water Mains and Sewers:

1. Existing and proposed water mains shall be at least 10 feet (3 m) horizontally from any proposed gravity flow and pressure (force main) sanitary sewer or sewer service connection.
2. Gravity flow mains and pressure (force) mains may be located closer than 10 feet (3 m) but not closer than 6 feet (1.8 m) to a water main when:
   a. Local conditions prevent a lateral separation of 10 feet (3 m); and
   b. The water main invert is at least 18 inches (450 mm) above the crown of the gravity sewer or 24 inches (600 mm) above the crown of the pressure (force) main; and the water main is in a separate trench separated by undisturbed earth.
3. When it is impossible to meet (1) or (2) above, both the water main and sanitary sewer main shall be constructed of push-on or mechanical joint ductile iron pipe.

B. Vertical Separation - Water Mains and Sewers at Crossings:

1. Water mains shall be separated from sewer mains so that the invert of the water main is a minimum of 24 inches (600 mm) above the crown of gravity flow sewer or 48 inches (1200 mm) above the crown of pressure (force) mains. The vertical separation shall be maintained within 10 feet (3 m) horizontally of the sewer and water crossing. When these vertical separations are met, no additional protection is required.
2. In no case shall pressure (force) sanitary main cross above, or within 24 inches (600 mm) of water lines.
3. When it is impossible to meet (1) above, the gravity flow sewer may be installed 18 inches (450 mm) above or 12 inches (300 mm) below the water main, provided that both the water main and sewer shall be constructed of push-on or mechanical ductile pipe. Pressure (Force) sewers may be installed 24 inches (600 mm) below the water line provided both the water line and sewer line are constructed of ductile iron pipe.
4. The required vertical separation between the sewer and the water main shall extend on each side of the crossing until the perpendicular distance from the water main to the sewer line is at least 10 feet (3 m).

3.16 IDENTIFICATION

A. Install green warning tape directly over piping and at outside edges of underground structures.

3.17 FIELD QUALITY CONTROL

A. All systems shall be inspected and obtain the Resident Engineer's approval. Prior to final acceptance, provide a video record of all piping from the building to the septic system to show the lines are free from obstructions, properly sloped and joined.

B. To inspect, thoroughly flush out the lines and structures before inspection.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.

b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.

c. Damage: Crushed, broken, cracked, or otherwise damaged piping.

d. Infiltration: Water leakage into piping.

e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

4. Re-inspect and repeat procedure until results are satisfactory.

C. Air Tests – NOT USED

3.18 CLEANING

A. Clean dirt and superfluous material from interior of piping.

END OF SECTION

SECTION 33 40 00
STORM SEWER UTILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies materials and procedures for construction of outside, underground storm sewer systems that are complete and ready for operation. This includes piping, structures, and all other incidentals.

1.2 RELATED WORK

A. Section 01 00 02, GENERAL REQUIREMENTS (Minor NCA Projects).
B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES: Materials and Testing Report Submittals.
C. Section 01 42 19, REFERENCE STANDARDS.
D. Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS: Erosion and Sediment Control.
E. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS.
F. //Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.//
G. Section 03 30 00, CAST-IN-PLACE CONCRETE: Concrete Work, Reinforcing, Placement and Finishing.
H. Section 05 50 00, METAL FABRICATIONS: Fabrication of Steel Ladders.
I. Section 22 14 00, FACILITY STORM DRAINAGE.
J. Section 31 20 00, EARTH MOVING: Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing.

1.3 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
B. American Association of State Highway and Transportation Officials (AASHTO):

HB-17-2002.....Standard Specifications for Highway Bridges, 17th Edition
M190-2004.....Standard Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
M252-2009.....Standard Specification for Corrugated Polyethylene Drainage Pipe
M294-2015.....Standard Specification for Corrugated Polyethylene Pipe, 300 to 1500 mm (12 to 60 In.) Diameter

C. American Concrete Institute (ACI):

318-2014 .....Building Code Requirements for Structural Concrete and Commentary

350-2006 .....Code Requirements for Environmental Engineering Concrete Structures and Commentary

D. American Society of Mechanical Engineers (ASME):

A112.6.3-2016.....Floor and Trench Drains

A112.14.1-2003.....Backwater Valves

A112.36.2M-1991 .....Cleanouts

E. American Society for Testing and Materials (ASTM):

A48/A48M-2003 (R2012).....Standard Specification for Gray Iron Castings

A242/A242M-2013 .....Standard Specification for High-Strength Low-Alloy Structural Steel

A536-1984 (R2014) .....Standard Specification for Ductile Iron Castings

A615/A615M-2016 .....Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

A760/A760M-2015 .....Standard Specification for Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains

A762/A762M-2015 .....Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains

A798/A798M-2013 .....Standard Specification for Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications

A849-2015.....Standard Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe

A929/A929M-2001(2013).....Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe

A1064/A1064M-2016 .....Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

B745/B745M-2015.....Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains

B788/B788M-2009 (R2014) .....Standard Specification for Installing Factory-Made Corrugated Aluminum Culverts and Storm Sewer Pipe

C14-2015a.....Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe

C33/C33M-2016.....Standard Specification for Concrete Aggregates

C76-2015a.....Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

C150/C150M-2016.....Standard Specification for Portland Cement

C443-2012.....Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets

C478-2015.....Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
C506-2016a.....Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
C507-2015.....Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
C828-2011.....Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines
C890-2013.....Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
C891-2011.....Standard Practice for Installation of Underground Precast Concrete Utility Structures
C913-2008.....Standard Specification for Precast Concrete Water and Wastewater Structures
C923-2008 (R2013)e1.....Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
C990-2009 (R2014).....Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
C1103-2014.....Standard Specification for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
C1173-2010 (R2014).....Standard Specification for Flexible Transition Couplings for Underground Piping Systems
C1433-2016a.....Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
C1479-2013.....Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations
D448-2012.....Standard Classification for Sizes of Aggregate for Road and Bridge Construction
D698-2012e2.....Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))
D1056-2014.....Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber
D2321-2014e1.....Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
D2661-2014.....Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings

D3034-2015.....Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
D3350-2014.....Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
D3753-2012e1.....Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells
D4101-2014.....Standard Specification for Polypropylene Injection and Extrusion Materials
D5926-2015.....Standard Specification for Poly (Vinyl Chloride) (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems
F477-2014 .....Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
F679-2015 .....Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
F714-2013 .....Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
F794-2003 (R2014).....Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
F891-2010 .....Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core
F894-2013 .....Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
F949-2015 .....Standard Specification for Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
F1417-2011a (R2015) .....Standard Practice for Installation Acceptance of Plastic Non-Pressure Sewer Lines Using Low-Pressure Air
F1668-2008 .....Standard Guide for Construction Procedures for Buried Plastic Pipe

F. American Water Works Association (AWWA):

C105-2010.....Polyethylene Encasement for Ductile-Iron Pipe Systems
C110-2012.....Ductile-Iron and Gray-Iron Fittings
C219-2011.....Bolted, Sleeve-Type Couplings for Plain-End Pipe
C600-2010.....Installation of Ductile iron Mains and Their Appurtenances
C900-2007.....Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution
M23-2002.....PVC Pipe: Design And Installation, Second Edition

G. National Stone, Sand and Gravel Association (NSSGA):
.....Quarried Stone for Erosion and Sediment Control

1.4 SUBMITTALS

A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Information and material submitted under this section shall be marked “SUBMITTED UNDER SECTION 33 40 00, STORM SEWER UTILITIES”, with applicable paragraph identification.

C. Manufacturer's Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.

D. Complete operating and maintenance manuals including wiring diagrams, technical data sheets, information for ordering replacement parts, and troubleshooting guide:
1. Include complete list indicating all components of the systems.
2. Include complete diagrams of the internal wiring for each item of equipment.
3. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.

E. Completed System Readiness Checklist provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.

F. Submit training plans and instructor qualifications in accordance with the requirements of Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.

1.5 QUALITY ASSURANCE

A. Products Criteria:
1. When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.
2. A nameplate bearing manufacturer's name or trademark, including model number, shall be securely affixed in a conspicuous place on equipment. In addition, the model number shall be either cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Handle manholes, catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.7 COORDINATION

A. Coordinate connection to storm sewer main with the Public Agency providing storm sewer off-site drainage.

B. Coordinate exterior utility lines and connections to building services up to the actual extent of building wall.

1.8 WARRANTY

A. Guaranty: Warranty of Construction, FAR clause 52.246-21.

B. The Contractor shall remedy any defect due to faulty material or workmanship and pay for any damage to other work resulting therefrom within a period of one year final acceptance. Further, the Contractor will furnish all manufacturers' and suppliers' written guarantees and warranties covering materials and equipment furnished under this Contract.

1.9 AS-BUILT DOCUMENTATION

A. Submit manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.

B. Submit operation and maintenance data updated to include submittal review comments, substitutions and construction revisions shall be in electronic version on USB flash drive inserted into a three ring binder. All aspects of system operation and maintenance procedures, including applicable piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Notes on all special systems or devices shall be included. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished. Information explaining any special knowledge or tools the owner will be required to employ shall be inserted into the As-Built documentation.

C. The installing contractor shall maintain as-built drawings of each completed phase for verification; and shall provide the complete set at the time of final systems certification testing. As-built drawings are to be provided, and a copy of them in Auto-CAD version 2020 provided on USB flash drive. Should the installing contractor engage the testing company to provide as-built or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement.

D. Certification documentation shall be provided to COR 10 working days prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and certification that all results of tests were within limits specified.

PART 2 - PRODUCTS

2.1 FACTORY-ASSEMBLED PRODUCTS

A. Standardization of components shall be maximized to reduce spare part requirements. Guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

2.2 STEEL PIPE AND FITTINGS – NOT USED

2.3 ALUMINUM PIPE AND FITTINGS – NOT USED

2.4 ABS PIPE AND FITTINGS – NOT USED

2.5 PE PIPE AND FITTINGS

A. Smoothwall PE drainage pipe – NOT USED

B. Corrugated PE pipe and fittings, DN 300 to DN 1500 (NPS 12 to NPS 60); AASHTO M294, Type S with smooth waterway for coupling joints. Pipe shall be produced from PE certified by the resin producer as meeting the requirements of ASTM D3350, minimum cell class 335434C.

1. Water tight joints shall be made using a PVC or PE coupling and rubber gaskets as recommended by the pipe manufacturer. Rubber gaskets shall conform to ASTM F477. Soil tight joints shall conform to requirements in AASHTO HB-17, Division II, for soil tightness and shall be as recommended by the manufacturer.

C. Profile Wall PE Pipe: NOT USED

2.6 PVC PIPE AND FITTINGS

A. PVC Cellular – NOT USED

B. PVC Corrugated Sewer Piping:

1. Pipe: ASTM F949, PS46, corrugated pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM F949, PVC molded or fabricated, socket type.
3. Gaskets: ASTM F477, elastomeric seals.

C. PVC Profile Sewer Piping – NOT USED.

D. PVC Type – NOT USED

E. PVC Gravity Sewer Piping:

1. Pipe and fittings shall be ASTM F679, PS46 PVC gravity sewer pipe with bell-and-spigot ends.
2. Gaskets: ASTM F477, elastomeric seals for gasketed joints.

F. PVC Pressure Piping – NOT USED

2.7 CONCRETE PIPE AND FITTINGS

A. Non-reinforced concrete sewer pipe – NOT USED

B. Reinforced concrete sewer pipe and fittings shall be ASTM C76.

1. Tongue and groove ends and gasketed joints with ASTM C443 rubber gaskets.
2. Class III: Wall B

2.8 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground non-pressure piping. Include ends of same sizes as piping to be joined, and corrosion resistant metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For concrete pipes: ASTM C443, rubber.
2. For plastic pipes: ASTM F477, elastomeric seal or ASTM D5926, PVC.
3. For dissimilar pipes: ASTM D5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings: Couplings shall be an elastomeric sleeve with stainless steel shear ring and corrosion resistant metal tension band and tightening mechanism on each end.

D. Shielded, flexible couplings shall be elastomeric or rubber sleeve with full length, corrosion resistant outer shield and corrosion resistant metal tension band and tightening mechanism on each end.

E. Ring-type, flexible couplings shall be elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.9 PRESSURE PIPE COUPLINGS – NOT USED

2.10 EXPANSION JOINTS AND DEFLECTION FITTINGS – NOT USED

2.11 BACKWATER VALVES – NOT USED

2.12 CLEANOUTS

A. Cast Iron Cleanouts: ASME A112.36.2M, round, gray iron housing with clamping device and round, secured, scoriated, gray iron cover. Include gray iron ferrule with inside calk or spigot connection and countersunk, tapered thread, brass closure plug.

1. Top-Loading Classification(s): Heavy Duty
2. Pipe fitting and riser to cleanout shall be same material as main pipe line.

B. Plastic Cleanouts shall have PVC body with PVC threaded plug. Pipe fitting and riser to cleanout shall be of same material as main line pipe.

2.13 DRAINS

A. Cast Iron Area Drains: ASME A112.6.3, gray iron round body with anchor flange and round secured grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
   1. Top-Loading Classification(s): Heavy Duty
B. Cast Iron Trench Drains: NOT USED
C. Steel Trench Drains: NOT USED
D. Grate openings shall be10 by 75 mm (3/8 by 3 inch) slots.

2.14 ENCASEMENT FOR PIPING – NOT USED

2.15 MANHOLES AND CATCH BASINS

A. Standard Precast Concrete Manholes:
   1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
   2. Diameter: 1200 mm (48 inches) minimum unless otherwise indicated.
   3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
   4. Base Section: 150 mm (6 inch) minimum thickness for floor slab and 100 mm (4 inch) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
   5. Riser Sections: 100 mm (4 inch) minimum thickness, and lengths to provide depth indicated.
   6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
   7. Joint Sealant: ASTM C990, bitumen or butyl rubber.
   8. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.
   9. Steps: If total depth from floor of manhole to finished grade is greater than 1500 mm (60 inches). Individual FRP steps: ASTM A615/A615M, deformed, 15 mm (1/2 inch) steel reinforcing rods encased in ASTM D4101, PP, width of 400 mm (16 inches) minimum, spaced at 300 to 400 mm (12 to 16 inch) intervals.
   10. Adjusting Rings: Reinforced concrete rings, 150 to 225 mm (6 to 9 inch) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.
B. Designed Precast Concrete Structures:
   1. Description: ASTM C913; designed for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
   2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
   3. Joint Sealant: ASTM C990, bitumen or butyl rubber.

4. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.
5. Steps: If total depth from floor of structure to finished grade is greater than 1500 mm (60 inches). Individual FRP steps: ASTM A615/A615M deformed, 15 mm (1/2 inch) steel reinforcing rods encased in ASTM D 4101, PP, width of 400 mm (16 inches) minimum, spaced at 300 to 400 mm (12 to 16 inch) intervals.
6. Adjusting Rings: Reinforced concrete rings, 150 to 225 mm (6 to 9 inches) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

C. Fiberglass Manholes: NOT USED

D. Manhole Frames and Covers:
1. Description: Ferrous; 600 mm (24 inch) ID by 175 to 225 mm (7 to 9 inch) riser with 100 mm (4 inch) minimum width flange and 660 mm (26 inch) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A48/A48M, Class 35 gray iron unless otherwise indicated.

2.16 CONCRETE FOR MANHOLES AND CATCH BASINS

A. General: Cast-in-place concrete according to ACI 318, ACI 350, and the following:
1. Cement: ASTM C150/C150M, Type II.
2. Fine Aggregate: ASTM C33/C33M, sand.
3. Coarse Aggregate: ASTM C33/C33M, crushed gravel.
4. Water: Potable.

B. Concrete Design Mix: 27.6 MPa (4000 psi) minimum, compressive strength in 28 days.
1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A615/A615M, Grade 60 420 MPa (60,000 psi) deformed steel.

C. Manhole Channels and Benches: Channels shall be the main line pipe material. Include benches in all manholes and catch basins.
1. Channels: Main line pipe material or concrete invert. Height of vertical sides to 3/4 of pipe diameter. Form curved channels with smooth, uniform radius and slope. Invert Slope: Same slope as the main line pipe. Bench to be concrete, sloped to drain into channel. Minimum of 6 inch slope from main line pipe to wall sides.

2.17 POLYMER-CONCRETE, CHANNEL DRAINAGE SYSTEMS – NOT USED

2.18 PLASTIC, CHANNEL DRAINAGE SYSTEMS – NOT USED

2.19 PIPE OUTLETS

A. Riprap basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."
   1. Average Size: NSSGA No. R-5, screen opening 125 mm (5 inches).

B. Filter Stone: NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, 6 mm (No. 4) screen opening, average size graded stone.

C. Energy Dissipaters: To be as per NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 2721 kg (3 ton) average weight armor stone, unless otherwise indicated.

2.20 DRY WELLS – NOT USED

2.21 STORMWATER DISPOSAL SYSTEMS – NOT USED

2.22 HEADWALLS

A. Headwalls: Cast-in-place concrete with a minimum compressive strength of 20 MPa (3000 psi) at 28 days.

2.23 FLARED END SECTIONS

A. Flared End Sections: Sections shall be of standard design reinforced concrete in accordance with Georgia DOT standards.

2.24 PRECAST REINFORCED CONCRETE BOX CULVERT – NOT USED

2.25 RESILIENT CONNECTORS AND DOWNSPOUT BOOTS FOR BUILDING ROOF DRAINS – NOT USED

2.26 WARNING TAPE

A. Standard, 4-Mil polyethylene 75 mm (3 inch) wide tape non-detectable tape, purple with black letters, and imprinted with “CAUTION BURIED STORM SEWER BELOW”.

PART 3 - EXECUTION

3.1 GENERAL

A. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.

3.2 PIPE BEDDING

A. The bedding surface of the pipe shall provide a firm foundation of uniform density throughout the entire length of pipe. Concrete pipe requirements are such that when no bedding class is specified, concrete pipe

shall be bedded in a soil foundation accurately shaped and rounded to conform to the lowest 1/4 of the outside portion of circular pipe. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall not be more than the length, depth, and width required for properly making the particular type of joint. Plastic pipe bedding requirements shall meet the requirements of ASTM D2321. Bedding, haunching and initial backfill shall be either Class IB or Class II material. Corrugated metal pipe bedding requirements shall conform to ASTM A798/A798M.

3.3 PIPING INSTALLATION

A. Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping with 450 mm (18 inch) minimum cover as shown on the Drawings.

C. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

1. Do not lay pipe on unstable material, in wet trench or when trench and weather conditions are unsuitable for the work.
2. Support pipe on compacted bedding material. Excavate bell holes only large enough to properly make the joint.
3. Inspect pipes and fittings, for defects before installation. Defective materials shall be plainly marked and removed from the site. Cut pipe shall have smooth regular ends at right angles to axis of pipe.
4. Clean interior of all pipe thoroughly before installation. When work is not in progress, open ends of pipe shall be closed securely to prevent entrance of storm water, dirt or other substances.
5. Lower pipe into trench carefully and bring to proper line, grade, and joint. After jointing, interior of each pipe shall be thoroughly wiped or swabbed to remove any dirt, trash or excess jointing materials.
6. Do not walk on pipe in trenches until covered by a depth of 300 mm (12 inches) over the crown of the pipe.
7. Warning tape shall be continuously placed 300 mm (12 inches) above storm sewer piping.

D. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

E. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

F. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

G. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
2. Install corrugated steel piping according to ASTM A798/A798M.

3. Install corrugated aluminum piping according to ASTM B788/B788M.
4. Install ABS sewer piping according to ASTM D2321 and ASTM F1668.
5. Install PE corrugated sewer piping according to ASTM D2321 with extrusion welded joints.
6. Install PVC cellular-core piping, PVC sewer piping, and PVC profile gravity sewer piping, according to ASTM D2321 and ASTM F1668.
7. Install reinforced concrete sewer piping according to ASTM C1479.

3.4 REGRADING

A. Raise or lower existing manholes and structures frames and covers in regraded areas to finish grade. Carefully remove, clean and salvage cast iron frames and covers. Adjust the elevation of the top of the manhole or structure as detailed on the drawings. Reset cast iron frame and cover, grouting below and around the frame. Install concrete collar around reset frame and cover as specified for new construction.

B. During periods when work is progressing on adjusting manholes or structures cover elevations, install a temporary cover above the bench of the structure or manhole. The temporary cover shall be installed above the high flow elevation within the structure, and shall prevent debris from entering the wastewater stream.

3.5 CONNECTIONS TO EXISTING VA-OWNED MANHOLES

A. Make pipe connections and alterations to existing manholes so that finished work will conform as nearly as practicable to the applicable requirements specified for new manholes, including concrete and masonry work, cutting, and shaping.

3.6 CONNECTIONS TO EXISTING PUBLIC UTILITY MANHOLES

A. Comply with all rules and regulations of the public utility.

B. Backwater Valve Installation – NOT USED

C. Cleanout Installation – NOT USED

3.7 DRAIN INSTALLATION

A. Install type of drains in locations indicated.
1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Embed drains in 100 mm (4 inch) minimum concrete around bottom and sides.

C. Set drain frames and covers with tops flush with pavement surface.

3.8 MANHOLE INSTALLATION

A. Install manholes, complete with appurtenances and accessories indicated. Install precast concrete manhole sections with sealants according to ASTM C891.

B. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 75 mm (3 inches) above finished surface elsewhere unless otherwise indicated.

C. Circular Structures:

1. Precast concrete segmental blocks shall lay true and plumb. All horizontal and vertical joints shall be completely filled with mortar. Parge interior and exterior of structure with 15 mm (1/2 inch) or cement mortar applied with a trowel and finished to an even glazed surface.
2. Precast reinforced concrete rings shall be installed true and plumb. The joints between rings and between rings and the base and top shall be sealed with a preform flexible gasket material specifically manufactured for this type of application. Adjust the length of the rings so that the eccentric conical top section will be at the required elevation. Cutting the conical top section is not acceptable.
3. Precast reinforced concrete manhole risers and tops. Install as specified for precast reinforced concrete rings.

D. Rectangular Structures:

1. Precast concrete structures shall be placed on a 200 mm (8 inch) reinforced concrete pad, or be provided with a precast concrete base section. Structures provided with a base section shall be set on a 200 mm (8 inch) thick aggregate base course compacted to a minimum of 95 percent of the maximum density as determined by ASTM D698. Set precast section true and plumb. Seal all joints with preform flexible gasket material.
2. Do not build structures when air temperature is 0 degrees C (32 degrees F), or below.
3. Invert channels shall be smooth and semicircular in shape conforming to inside of adjacent sewer section. Make changes in direction of flow with a smooth curve of as large a radius as size of structure will permit. Make changes in size and grade of channels gradually and evenly. Construct invert channels by one of the listed methods:
    a. Forming directly in concrete base of structure.
    b. Building up with brick and mortar.
4. Floor of structure outside the channels shall be smooth and slope toward channels not less than 1 to 12 or more than 1 to 6. Bottom slab and benches shall be concrete.
5. The wall that supports access rungs or ladder shall be 90 deg vertical from the floor of structure to manhole cover.
6. Install steps and ladders per the manufacturer’s recommendations. Steps and ladders shall not move or flex when used. All loose steps and ladders shall be replaced by the Contractor.
7. Install manhole frames and covers on a mortar bed, and flush with the finish pavement. Frames and covers shall not move when subject to vehicular traffic. Install a concrete collar around the frame to protect the frame from moving until the adjacent pavement is placed. In unpaved areas, the rim elevation shall be 50 mm (2 inches) above the adjacent finish grade. Install a 200 mm (8 inch) thick, by 300 mm (12 inch) concrete collar around the perimeter of the frame. Slope the top of the collar away from the frame.

3.9 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.10 STORMWATER INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete.

B. Construct riprap of broken stone.

C. Install outlets that spill onto grade, anchored with concrete.

D. Install outlets that spill onto grade, with flared end sections that match pipe.

E. Construct energy dissipaters at outlets.

3.11 DRY WELL INSTALLATION - NOT USED

3.12 CHANNEL DRAINAGE SYSTEM INSTALLATION - NOT USED

3.13 STORMWATER DISPOSAL SYSTEM INSTALLATION – NOT USED

3.14 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 200 mm (8 inch) thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:

1. Remove manhole or structure and close open ends of remaining piping.
2. Remove top of manhole or structure down to at least 900 mm (36 inches) below final grade. Fill to within 300 mm (12 inches) of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade according to Section 31 20 00, EARTH MOVING.

3.15 IDENTIFICATION

A. Install green warning tape directly over piping and at outside edge of underground structures.

3.16 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Prior to final acceptance, provide a video record of all piping from the building to the municipal connection to show the lines are free from obstructions, properly sloped and joined.
   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   4. Reinspect and repeat procedure until results are satisfactory.

3.17 STARTUP AND TESTING

A. Make tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
B. Submit separate report for each test.
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 requirements of authorities having jurisdiction.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.
   4. Submit separate report for each test.
   5. Air test gravity sewers. Concrete pipes conform to ASTM C924, plastic pipes conform to ASTM F1417, all other pipe material conform to ASTM C828 or ASTM C924, after consulting with pipe manufacturer. Testing of individual joints shall conform to ASTM C1103.
   6. Test force main storm drainage piping. Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than //1034 kPa (150 psi)// //Insert value//.
      a. Ductile Iron Piping: Test according to AWWA C600, "Hydraulic Testing" Section.
      b. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.

D. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government. Leaks and loss in test pressure constitute defects that must be repaired. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

E. The Commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the COR and Commissioning Agent. Provide a minimum notice of 10 working days prior to startup and testing.

3.18 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

3.19 COMMISSIONING

A. Provide commissioning documentation in accordance with the requirements of Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.

B. Components provided under this section of the specification will be tested as part of a larger system.

3.20 DEMONSTRATION AND TRAINING

A. Provide services of manufacturer’s technical representative for four hours to instruct each VA personnel responsible in the operation and maintenance of units.

B. Submit training plans and instructor qualifications in accordance with the requirements of Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.

END OF SECTION