



**INVITATION FOR BIDS
and
Specifications and Contractual Requirements
For
Finklea Fire Station
Horry County, South Carolina**

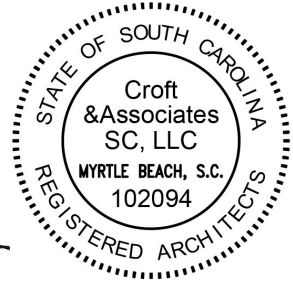
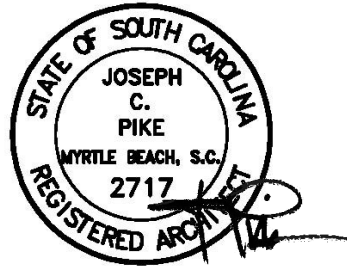
BID# 2023-24-091

Due: 2:00 p.m. EST, May 29, 2025

The Following Applies to this solicitation:

- *Mandatory Pre-Bid Meeting: May 7, 2025 at 10:00 a.m. EST at SC Hwy 9 Business, PIN#15612020008*
- *Questions Acceptance Deadline: May 12, 2025 at 2:00 p.m. EST*
- *Required Bid Forms Packet must be submitted with responses to this IFB.*
- *A Bid Bond is required.*

PROJECT MANUAL



A NEW BUILDING REPLACEMENT FOR: FINKLEA FIRE STATION #6

PMH CROFT NO. 24002
Horry County Bid #2023-24-091



HORRY COUNTY
307 SMITH STREET
CONWAY, SC

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PROJECT MANUAL
A NEW BUILDING REPLACEMENT FOR:
FINKLEA FIRE STATION #6

PROJECT MANUAL DATED JULY 2024

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PROJECT DIRECTORY

A NEW BUILDING REPLACEMENT FOR: FINKLEA FIRE STATION #6 HORRY COUNTY CONTRACT NO. 2023-24-091

OWNER: HORRY COUNTY
307 Smith Street
Conway, SC 29526
(843) 915-5300
(843) 915-6300 FAX
Attention: Mr. John Barnhill, Director of Construction & Maintenance

ARCHITECT: PMH CROFT
1300 Professional Drive, Suite 201
Myrtle Beach, SC 29577
(843) 497-0272
(843) 497-0271 FAX
Attention: Ms. Diane Price, LEED-AP, Project Manager
Mr. Joseph C. Pike, AIA

CIVIL ENGINEER: DIAMOND SHORES, LLC
315 Main Street, Unit 11
Conway, SC 29526
(843) 488-2900
Attention: Mr. David Schwerd, COO

**STRUCTURAL
ENGINEER:** WEATHERLY ENGINEERING, LLC
514 Alder Street, Box B, Suite 2
Myrtle Beach, SC 29577
(843) 448-3428
(843) 445-9116 FAX
Attention: Mr. Ashleigh Weatherly, P.E

**PLUMBING
MECHANICAL
ELECTRICAL
FIRE PROTECTION
ENGINEER** RAST DALLERY ENGINEERS, PC
514 Alder Street, Suite 4
Myrtle Beach, SC 29577
(843) 232-0408
(843) 232-0508 FAX
Attention: Mr. Robert Dallery, P.E.

END OF PROJECT DIRECTORY

DOCUMENT 00020 – INVITATION FOR BIDS – FULL LEGAL ADVERTISEMENT

Horry County Government is soliciting sealed bids from properly licensed contractors in South Carolina for IFB# 2023-24-091 A New Replacement For: Finklea Fire Station #6. All bids MUST be received electronically through BidNet no later than 2:00 p.m., local time, May 29, 2025. No fax, email, telephone, hand-delivered, or text bid submittals will be accepted.

Information regarding this Invitation for Bid (IFB) can be obtained by visiting the e bidding software, BidNet at no cost, at <https://www.bidnetdirect.com/southcarolina/horrycounty>

Your firm is required to provide bid security in the amount of five percent (5%) of the base bid (excluding alternates and/or optional bid items). The successful and awarded bidder will be required to submit Performance and Payment Bonds in the sum of no less than one hundred percent (100%) of the contract amount.

Local Vendor Preference may be applicable to this sealed bid process.

Electronic bid submittals must include the bidder's current (active) State of SC General Contractor's License.

1. The Work includes pre-engineered steel structures, slab on grade floor and spread footing foundations. The exterior consists of masonry, brick, EIFS, and metal siding with prefinished aluminum windows, metal roof, interior CMU and metal stud partitions with painted gypsum board finish, suspended acoustical and gypsum board ceiling systems, poured epoxy and LVP flooring and other various finishes. The facility shall be provided with a fire suppression system throughout. Facility will be connected to public water and sewer. The Work also includes structural, plumbing, fire sprinkler, mechanical, electrical, civil, and landscaping.
2. Base Bid is for a 3-truck bay Fire Station.
3. Alternate #1 is for the addition of a 4th truck bay.

The point of contact for this project is Carol Durham, durham.carol@horrycountysc.gov Direct all questions to Horry County's e bidding software.

END OF DOCUMENT 00020

DOCUMENT 00030 – INSTRUCTIONS TO BIDDERS

Bids shall be submitted through Horry County's electronic bidding software, BidNet ONLY at: <https://www.bidnetdirect.com/southcarolina/horrycounty>, on or before the due_date and time noted on the cover page of this document, or the date specified in Horry County's electronic bidding software for this project if amended by an addendum. The only acceptable means of submitting a bid in reference to this project is through Horry County's electronic bid software. Therefore, no email, fax, hand-delivered, telephone, or text bid submittals will be accepted.

Pricing must be provided as indicated in the electronic bid software. If there is no charge for a specific item listed, bidders must enter \$0.00. Leaving item pricing blank indicates a "No Bid" for the item.

Bidders should include all required forms, and all specification and descriptive documents to be considered, at the time of bid submittal or their bid may be deemed non-responsive.

Bids shall be submitted no later than **2:00 PM Local Time, May 29, 2025** through BidNet as stated above. Bids received later than the 2:00 PM deadline will be considered "**LATE BIDS**".

MANDATORY PRE-BID CONFERENCE/WALKTHROUGH

A Mandatory Pre-Bid Conference / Walkthrough will be held at SC HWY Business, PIN #15612020008 on Wednesday, May 7, 2025 at 10:00 A.M. All sub-contractors are strongly encouraged to attend the Mandatory Pre-Bid Conference / Walkthrough.

The bidder shall sign his bid correctly. All offers shall be uploaded into Horry County's electronic bidding software, BidNet. Bid proposals may be rejected if any omissions, alteration of form, additions not called for, or any irregularities of any kind are shown. The bid shall remain firm for not less than sixty (60) calendar days from the date of bid receipt.

LICENSES

All BIDDERS must be properly licensed to do business in the State of South Carolina and must comply with the Code of Laws of South Carolina, including Section 40-11-200, when applicable. Your company does not need to be based in South Carolina, but must be licensed to do business in the state of SC and specifically Horry County, if awarded a contract. Failure to comply with this requirement may result in the rejection of the bid as non-responsive.

The bidder's name and solicitation number shall be included when specifications or descriptive papers are submitted with the Invitation for Bid (IFB).

By submission of a bid, the bidder guarantees that all goods and services meet the requirements of the solicitation.

The bidder's name and solicitation number shall be included when specifications or descriptive papers are submitted with the Invitation for Bid (IFB).

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SALES TAX

Horry County Government is required to pay sales tax. Horry County's tax rate is eight percent (8%), except on purchases/work/deliveries within the city limits of Myrtle Beach, where the tax rate is nine percent (9%).

The County is **NOT** sales exempt. **Horry County is required to pay South Carolina Sales Tax. Sales Tax is expected to be included in the bidder's electronic bid submittal.**

SHIPPING/DELIVERY

All deliveries shall be bid as F.O.B. point Destination-freight prepaid, the seller pays and bears all freight charges; collect shipments will not be accepted. It is agreed by the parties hereto that delivery by the Contracted Supplier to the common carrier does not constitute delivery to the County. Delivery must meet the guaranteed delivery date agreed upon after receipt of order (ARO). Any claim for loss or damage shall be between the Contracted Supplier and the carrier. Items must be shipped/delivered to the location(s) as indicated on the cover page of this document. Items ordered under the contract resulting from this IFB must be delivered within the time frame (ARO) as indicated on the cover page of this document.

LOCAL VENDOR PREFERENCE – Local Vendor Preference affidavit and required documentation MUST be submitted WITH a vendor's SEALED BID to be considered, per Horry County Council Resolution # 116-13. Please see attached documentation.

BID BOND

Each Bid must be accompanied by a Bid Bond made payable to Horry County in an amount of five percent (5%) of the Total Base Bid Amount. The Bid Bond Form and Powers of Attorney (POA) must be completed and submitted in Horry County's electronic bid software by means of digital reproduction. Bid Bonds must be duly executed by the bidder as principal and issued by a surety authorized to conduct business in the State of South Carolina.

This is a guarantee that the successful bidder will enter into a contract with Horry County. The aforementioned guarantee, is to be retained by the Horry County as liquidated damages in the event the successful Bidder fails to enter into the contract as provided herein.

Any cost of the bonds should be included as the same as other necessary items not specifically quantified on the Bid Form in the electronic bid software.

Improperly completed information and irregularities in bid bond may be cause to reject a bid.

QUESTIONS / ADDENDA

All questions must be submitted via Horry County's e-bidding software prior to the Questions Acceptance Deadline as specified in the e-bidding software. Each question must be submitted individually within the "Q&A" section of the electronic bid software.

All questions and revisions will be provided in the electronic bid software via addendum. If it becomes necessary to revise any part of this solicitation, an addendum will be published. It shall be the Bidder's responsibility to ensure s/he has all addenda which have been issued by visiting Horry County's e-bidding software <https://www.bidnetdirect.com/southcarolina/horrycounty>. **Any information obtained outside of the procurement process is non-binding and shall not be used in response to this solicitation.**

All Addenda forms a part of the documents for this project and modifies / amends/ clarifies / adds to the original documents as described above. By submitting a response, bidders acknowledgement receipt and inclusion of the effects of all addenda.

Potential and actual bidders are not permitted to contact Horry County employees outside of the Procurement Department during the procurement process. Potential and actual bidders are not permitted to contact any consultants contracted by the County to assist with efforts related, directly or indirectly, to the procurement process. Failure to comply with Horry County Procurement Regulation, Chapter 4,

Contractor Requirements and Standards of Conduct for Horry County and Procurement participants may result in the rejection of the proposal and other penalties as applicable.

DEVIATIONS

Any deviations from the scope of work, as indicated herein, must be submitted in writing and clearly noted and explained in detail on a separate form and attached to the submitted bid. If deviations are not noted within the bid submittal, all items/services offered must begin strict compliance with these specifications and successful bidder shall be held responsible thereto.

Written consent from the Director of Procurement must be submitted should any changes in specifications be made after the contract has been awarded; otherwise, the responsibility for such changes shall be with the bidder. **Verbal information obtained otherwise will be non-binding.**

Horry County reserves the right to reject any or all bid proposals. It further reserves the right to waive technicalities and informalities in bids as well as to accept in whole or in part such bid or bids where it deems it advisable in protection of the best interest of the County of Horry, South Carolina. The County will be the sole judge as to whether bids submitted meet all requirements contained in this IFB.

CONTRACT REQUIREMENTS REVIEW MEETING

The apparent low bidder and major subcontractors will be required to attend a Contract Requirements Review Meeting(s). the General Contractor's designated Project Manager, Superintendent and Estimator shall be required to attend this meeting(s). the Project Manager, Superintendent, and Estimator for each major Subcontractor shall be required to attend this meeting(s). Additional review meetings including technical (field) representatives from the major suppliers may also be required. The Sub-Contractor's Project Superintendent shall lead that portion of the meeting that addresses their particular trade. **Sub-Contractors at the Contract Requirement Review Meeting(s) are required to acknowledge full sets of Construction Documents were used during the bidding process.**

Horry County hereby notifies all those responding to this IFB that, in accordance with the provisions of the Civil Rights Act of 1964 (4 Chapter 21, Title 42, of the U.S. Code) and Regulations promulgated in connection therewith, that it will affirmatively ensure that any contract entered into pursuant to this IFB, disadvantaged business enterprises will be afforded full and fair opportunity to make submittals in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

Award of contract will be made to the lowest responsive and responsible bidder meeting the requirements of Horry County solicitation.

The successful bidder will be expected to agree to the provisions contained in AIA DOCUMENT A101 STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR where the Basis of Payment is a STIPULATED SUM – Latest Edition by executing a copy of that contract.

Funding - The Goods and/or Services solicited in this IFB are intended to be purchased with County Funds. However, in the event that Grant and/or State or Federal Funding is available, Horry County requires compliance with all applicable federal, state, local and/or grant rules and regulations related to such funding.

INSURANCE REQUIREMENTS

The successful bidder shall provide proof of all required insurance(s), including worker's compensation, auto liability and general liability. Worker's compensation shall include a minimum limit of \$100,000 per accident and comprehensive general liability coverage shall provide minimum limits of liability of \$1,000,000 per occurrence. This shall include coverage for premises/operations, products/completed operations,

contractual liability, independent contractors and vehicles used in premises/operations. Commercial auto liability shall include a minimum limit of \$1,000,000 combined single limit for bodily injury and property damage. Professional Liability insurance must be provided with minimum liability limits of \$1,000,000 per occurrence (in addition to Commercial General Liability insurance) by professional services such as accountant, attorney, architect, design, engineering and most consultants that involve errors and omissions exposure protection. Insurance shall indemnify County against any and all claims arising under or as a result of the performance of the contract. The County of Horry shall be named as an Additional Insured on all General Liability policies and expressed on the Certificate of Liability Insurance. The County of Horry must be provided with notice prior to cancellation, modification or reduction in limits of any stipulated insurance. The Certificate Holder address shall be: Horry County, ATTN: Risk Management, P.O. Box 997, Conway, SC 29528.

PERFORMANCE BOND - A performance bond in the amount of 100% of the contract price shall be required. The performance bond shall be delivered by the contractor to the County at the same time the contract is executed. If a contractor fails to deliver the required performance bond, the contractor's bid shall be rejected, its bid security shall be enforced, and award of contract shall be made to the next lowest responsible and responsible bidder. The bond shall be issued from a surety approved to operate in the State of South Carolina and shall have a proper seal, with a minimum Best Rating of performance of "A". At no time during the contract will it be permissible for the performance bond to lapse.

PAYMENT (Labor and Materials) BOND - A payment bond in the amount of 100% of the contract price shall be required. The payment bond shall be delivered by the contractor to the County at the same time the contract is executed. If a contractor fails to deliver the required payment bond, the contractor's bid shall be rejected, its bid security shall be enforced, and award of contract shall be made to the next lowest responsive and responsible bidder. The bond shall be issued from a surety approved to operate in the State of South Carolina and shall have a proper seal, with a minimum Best Rating of performance of "A". At no time during the contract will it be permissible for the payment bond to lapse.

NON-COLLUSION - By submitting a response, the party making the foregoing offer that such offer is genuine and not collusive or sham; that said Responder has not colluded, conspired, connived, or agreed, directly or indirectly with any responder or person, to put in a sham response, or that such other person shall refrain from offering and has not in any manner, directly or indirectly sought by agreement or collusion, or communication or conference, with any person to fix the submittal of affiant or any other responder or to fix any overhead, profit or cost element of said Response or of that of any other responder or to secure any advantage against owner any person interested in the proposed contract; and that all statements in said Response are true; and further, that such responder has not, directly or indirectly submitted in this Invitation for Bids, or the contents thereof, or divulged information or data relative thereto to any association or to any member or agent thereof.

GRIEVANCE - Any actual or prospective respondent who aggrieved in connection with this procurement or award of a contract may protest to the County Administrator. The protest shall be submitted in writing within fourteen (14) days after such aggrieved person knows or should have known of the facts giving rise thereto provided that grievance has been made in accordance with bid proposal requirement. Any grievance by a bidder shall be made known prior to any bid opening in accordance with invitation to bids. *Please reference Subchapter 15-3-Bid Protests of the Horry County Code & Regulation by visiting: <https://www.horrycountysc.gov/media/ygbcfubd/codeandreg.pdf>*

FREEDOM OF INFORMATION STATEMENT - Procurement information shall be a public record to the extent required by Chapter 4 of Title 30, Code of Laws of South Carolina (1976, as amended) (The Freedom of Information Act), with the exception that commercial or financial information obtained in response to a "Invitation for Bids" which is privileged and confidential if so designated by the proposer shall be protected from disclosure. Such information must be clearly marked as "CONFIDENTIAL" by those submitting responses for each section of information so affected. Privileged and confidential information is information

in specific detail not customarily released to the general public, the release of which might cause harm to the competitive position of the party supplying the information.

END OF SECTION 00030

 AIA® Document A701® – 2018**Instructions to Bidders**

for the following Project:
(Name, location, and detailed description)

A New Building Replacement For:
Finklea Fire Station #6
Horry County, SC

The Work includes pre-engineered steel structures, slab on grade floor and spread footing foundations. The exterior consists of masonry, brick, EIFS, and metal siding with prefinished aluminum windows, metal roof, interior CMU and metal stud partitions with painted gypsum board finish, suspended acoustical and gypsum board ceiling systems, poured epoxy and LVP flooring and other various finishes. The facility shall be provided with a fire suppression system throughout. Facility will be connected to public water and sewer. The Work also includes structural, plumbing, fire sprinkler, mechanical, electrical, civil, and landscaping.

Base Bid is for a 3-truck bay Fire Station.
Alternate #1 is for the addition of a 4th truck bay.

THE OWNER:

(Name, legal status, address, and other information)

Horry County
307 Smith Street
Conway, SC 29526

THE ARCHITECT:

(Name, legal status, address, and other information)

CROFT & Associates SC, LLC dba: PMH CROFT
1300 Professional Drive, Suite 201
Myrtle Beach, SC 29577

ADDITIONS AND DELETIONS:

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

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

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

TABLE OF ARTICLES

1	DEFINITIONS
2	BIDDER'S REPRESENTATIONS
3	BIDDING DOCUMENTS
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6	POST-BID INFORMATION
7	PERFORMANCE BOND AND PAYMENT BOND
8	ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

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

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- .1 the Bidder has read and understands the Bidding Documents;
- .2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- .3 the Bid complies with the Bidding Documents;
- .4 the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- .5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- .6 the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

Bids from Contractors properly licensed in South Carolina will be received by the Office of Procurement on May 29, 2025 until 2:00 PM local time, through Horry County's electronic e-bidding software, BidNet at <https://www.bidnetdirect.com/southcarolina/horrycounty>

(Paragraphs deleted)

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the - County of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing *(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)*

All questions must be submitted via Horry County's ebidding software, prior to the Acceptance Deadline as specified in the ebidding software. Each question should be submitted individually within the Q&A section of the electronic bid software.

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be submitted via Horry County's ebidding software, prior to the Questions Acceptance Deadline as specified in the ebidding software. All attachments shall be sent via email to Carol Durham, at durham.carol@horrycountysc.gov.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 All questions and revisions will be provided in the ebidding software in the form of addendum. If it becomes necessary to revise any part of this IFB, an addendum will be published. It shall be the bidder's responsibility to ensure she/he has all addenda which have been issued. Any information obtained outside of the procurement process is non-binding and shall not be used in response to this solicitation.

All Addenda form a part of the documents for this project and modifies / amends / clarifies / adds to the original documents as described. By submitting a response (bid), bidders acknowledge receipt and inclusion of the effects of all addenda

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

All Addenda will be posted on Horry County's ebidding software at <https://www.bidnetdirect.com/southcarolina/horrycounty>

§ 3.4.2 Addenda will be available in the ebidding software: <https://www.bidnetdirect.com/southcarolina/horrycounty>.

§ 3.4.3 Addenda will be issued no later than six calendar days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Examination of Bid Documents. All official documents, as published by Horry County Government, should be downloaded from Horry County's electronic bid software (BidNet) and reviewed prior to submission of an offer, unless otherwise indicated. Failure to comply with requirements, as listed in the solicitation documents, may result in the offer being rejected as non-responsive.

Prior to submitting a bid, each bidder shall carefully examine the Bidding documents, study and thoroughly familiarize themselves with the specifications/requirements thereof, and notify the Owner of all conflicts, errors or discrepancies.

Bid submittals may be rejected if any omissions, alteration of form, additions not called for, conditional offers, or any irregularities of any kind are shown. Failure to comply with all requirements, as listed in the solicitation documents, may result in the offer being rejected as non-responsive.

The bid shall remain firm for no less than one hundred (100) calendar days, from the date of bid closing date.

Drawings/Maps shall be obtained in the ebidding software unless otherwise specified.

The bidder's name and solicitation number shall be included when specifications or descriptive papers are submitted with the invitation for bid (IFB).

The work under the resulting contract includes the furnishing of all labor, materials, equipment, and all items and services of every nature whether particularly mentioned or not in this solicitation, as required to complete the construction as specified, herein.

All work is to be done in accordance with drawings, specifications, and any permit conditions of federal, state, local, or any other agencies having jurisdiction.

Required Bid Forms. Submit ALL required forms. The required forms packet is a separate downloadable file in BidNet, titled "Required Bid Forms Packet." The bidder must include the required forms or their bid proposal may be deemed non-responsive.

Site Assessment. The bidder is expected to have become familiar with and take into consideration site conditions which may affect the work and to check all conditions and dimensions at the site.

Each bidder shall acquaint themselves thoroughly as to the character and nature of the work to be done. Each bidder furthermore shall make a careful examination of the site of the work and inform themselves fully as to the difficulties to be encountered in performance of the work, the facilities for delivering, storing and placing materials and equipment and other conditions relating to construction and labor.

The bidder shall examine the premises and the site and compare them with any applicable drawings and specifications. (S) he shall familiarize themselves with the existing conditions.

No plea of ignorance of conditions that exist or may hereafter exist on the site of the work, as a result of failure to make necessary investigations and examinations, will be accepted as an excuse for any failure or omission on the part of the Contractor to fulfill in every detail all the requirements of the contract documents and to complete the work for the consideration set forth therein, or as a basis for any claim whatsoever.

Insofar as impossible, the Contractor in carrying out his/her work, must employ such methods or means as will not cause interruption of or interference with the work of any other Contractor, or County personnel at the site.

When geotechnical data is provided by the Owner, the Bidder shall assume responsibility for any conclusions he/she may draw from such data. (S)he may employ his/her own consultants to analyze available information and shall be responsible for any conclusions drawn from that information. The Bidder is encouraged to perform their own investigations if they would like to do so. The cost of such employment of investigations shall be borne solely by the Bidder.

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks Shall be legibly executed on the Required Forms.

(Paragraph deleted)

§

§ 4.1.4 Edits to entries made on the Required Forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If there is no charge for a specific item listed, bidders must enter \$0.00. Leaving item pricing blank indicates a "No Bid" for the item, or as required by the bid form.

(Paragraph deleted)

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

A Bid Bond is a guarantee that the successful bidder will enter into a contract with Horry County. The aforementioned guarantee is to be retained by Horry County as liquidated damages in the event the successful Bidder fails to enter into the contract as provided herein.

Each Bid must be accompanied by a Bid Bond made payable to Horry County in an amount of five percent (5%) of the Bid Total. Bid bond is to be based on five percent, not a dollar amount. The "Required" Bid Bond Form and Powers of Attorney (POA) must be completed and submitted in Horry County's electronic bid software. Bid Bonds must be duly executed by the bidder as principal and issued by a surety authorized to conduct business in the State of South Carolina.

Any cost of the bonds should be included as the same as other necessary items not specifically quantified on the electronic Bid Form,

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

(Paragraph deleted)

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

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:

(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

Sealed bids shall be submitted via County's electronic bid software ONLY, on or before the Closing date and time indicated in the ebidding software for this project. The only acceptable means of submitting a bid in reference to this project is through Horry County's electronic bid software. Therefore, no email, fax, hand delivered, telephone, or text bid submittals will be accepted.

Pricing must be provided as indicated in the electronic bid software. For additional details see "Lump Sum Pricing"

The bidder must include the required items listed in the Required Forms Packet or their bid may be deemed non-responsive.

The County, at its sole discretion, reserves the right to accept or reject any and all bids, in whole or in part, that are deemed to be in the best interest of the County.

(Paragraph deleted)

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the electronic bidding software. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery to the electronic bidding software.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

(Paragraphs deleted)

§ 4.4. Correction or withdrawal of the submitted offer will be permitted within the ebidding software prior to the Closing date and time.

§

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the County of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the County, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:

(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

The Bid Security will be returned once the project has officially been awarded.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

(Paragraph deleted)

Unofficial results will be made publicly available in the County's eBidding software within an estimated time of sixty (60) minutes after the established Closing date and time.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the Owner's intent to award a contract to the lowest responsible and responsive bidder whose bid meets the requirements and criteria set forth in the IFB and is deemed most advantageous to the County. In determining the lowest responsible and responsive bidder, the County will consider/evaluate the bidders' past and current performance of other County contracts.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Owner, upon request and within the timeframe specified by the Owner, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

Goods and/or services solicited in this IFB are anticipated to be purchased with County Funds. However, in the event that Grant and/or State or Federal Funding is available, Horry County requires compliance with all applicable federal, state, local and/or grant rules and regulations related to such funding.

If (a) sufficient funds are not budgeted or appropriated and budgeted by Horry County Council in any fiscal period for payment of costs and fees and (b) Horry County has exhausted all funds legally available for such payment costs and fees due under this agreement or any renewal thereof, then Horry County will give awarded Bidder reasonable written notice and this Agreement will terminate as of the last day of Horry County's fiscal period for which funds for payment are available. Such termination with notice is without any expense or penalty.

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that the financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

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

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

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

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Performance and Payment (Labor and Materials Payment Bond) bonds in the amount of 100% of the contract price shall be required. The bonds shall be delivered by the contractor to the County at the same time the contract is executed. If a contractor fails to deliver the required performance bond, the contractor's bid shall be rejected, its bid security shall be enforced, and award of contract shall be made to the next lowest responsive bidder. The bond shall be issued from a surety approved to operate in the State of South Carolina and shall have a "raised" seal, with a minimum Best Rating of performance of "A". At no time during the contract will it be permissible for the performance bond to lapse.

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.

(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on the County's forms.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

- .1 AIA Document A101™-2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.

(Insert the complete AIA Document number, including year, and Document title.)

(Paragraphs deleted) To be issued once the project has been awarded. *DRAFT* Agreement is available for viewing should the Prime Bidder wish to review it before hand.

.2 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.

(Insert the complete AIA Document number, including year, and Document title.)

(Paragraphs deleted)

(Table deleted)

(Paragraphs deleted) This Document is inserted in the Project Manual.

Required Form
FORM OF NONCOLLUSION AFFIDAVIT
(This Affidavit is Part of the Bid Proposal)

STATE OF _____)
)
COUNTY OF _____)

_____ **being first duly sworn, deposes and says that he/she is**

_____ **(Sole owner, a partner, president, secretary, etc.)**

of _____

the party making the foregoing Bid Proposal that such Bid Proposal is genuine and not collusive or sham; that said Bidder has not colluded, conspired, connived, or agreed directly or indirectly, with any Bidder or person to put in a sham Bid Proposal, or that such other person shall refrain from offering and has not in any manner, directly or indirectly sought by agreement or collusion, or communication of conference, with any person, to fix the bid proposal price of affiant or any other Bidder, or to fix any overhead, profit or cost element of said bid proposal price, or that of any other Bidder to secure any advantage against OWNER any person interested in the proposed Contract; and that all statements in said Bid Proposal are true; and further, that such Bidder has not, directly or indirectly submitted this bid proposal, or the contents thereof, or divulged information or data relative thereto to any association or to any member or agent thereof.

(Bidder)

Sworn to and subscribed before me this _____ day of _____, 20_____.

_____ State _____ County _____
Notary Public in and for

My commission expires _____, 20_____.

DOCUMENT 00200 – SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

ARTICLE 1 DEFINITIONS

Paragraph 1.6 Alternates:

Add the following "Alternate prices as required, are listed in Section 01100 of the Specifications, entitled "Alternates".

ARTICLE 2 BIDDER'S REPRESENTATION

Paragraph 2.1.4 Site Visit:

Add the following: "Failure to do so will be at the Bidder's own risk and he cannot attain release of responsibility on the plea of an error in his bid".

ARTICLE 3 BIDDING DOCUMENTS

Paragraph 3.1 Distribution:

Delete Sub-Paragraph 3.1.2 in its entirety and substitute therefore the following:

"Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within fifteen days after receipt of Bids. The cost to replace missing or damages paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

Paragraph 3.3 Substitutions:

Delete Sub-Paragraph 3.3.1 in its entirety and substitute therefore the following:

"Specific reference in the specifications to any article, device, product, materials, fixtures, form or type of construction etc., by name, make or catalog number, with or without the words approved substitution shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition and the contractor in such cases may, at his option, use an article, device, product, material, fixture, form, or type of construction which in the judgment of the architect expressed in writing, is an approved substitution to that specified".

Paragraph 3.3.2 Substitution Process

Delete Sub-Paragraphs 3.3.2.1, 3.3.2.2 and 3.3.2.3 in their entirety and substitute the following:

"No substitute to that specified or called for on the drawings will be considered unless request for approval is submitted NOT LESS THAN TEN (10) CALENDAR DAYS PRIOR TO THE BID DATE and approval of same issued to all Bidders of Record by Addendum not later than five (5) calendar days prior to the bid date". Each request shall contain the following:

- a. Name of project and location.
- b. Name of material or equipment to be submitted.
- c. Performance and test data.
- d. Any and all other detailed specification information required for an evaluation.
- e. Specified location of item in contract documents.
- f. Complete list designating any changes in related materials, equipment, and/or work that inclusion of substitute would necessitate.
- g. Line by line difference comparisons between specified item and item submitted for approval.
- h. Drawings, if needed.
- i. Samples, when applicable.

NOTE: NO REQUEST WILL BE CONSIDERED UNLESS ALL RELATED INFORMATION IS SUBMITTED.

The Architect's decision of approval or disapproval of the request for substitution shall be

final. The successful bidder shall be responsible for using only materials, equipment, and/or work as stipulated in these specifications, or as published as an approved substitution.

Paragraph 3.3.3 Burden of Proof
Delete 3.3.3 in its entirety

Paragraph 3.4.3 Issuance of Addenda:
Delete 3.4.3 in its entirety and substitute the following:

No addenda shall be issued later than Five (5) Calendar days prior to the date of receipt of bids unless change does not involve a price, or is to change the Bid Date.

ARTICLE 4 BIDDING PROCEDURE

Paragraph 4.1.9 - Add the following:

"§4.1.9 Any item listed in Paragraphs 4.1.4, 4.1.5 and 4.1.7 or irregularity of any kind shall be considered reason for rejection of bid by the Owner."

Paragraph 4.2 Bid Security:

Delete in its entirety and substitute the following:

"A Bid Security will be required for this Project in accordance with Section 00020 – Invitation for Bids."

Paragraph 4.3.2 Bidding Documents:

Delete in its entirety. For clarification, Bids are to be submitted as described in the Invitation for Bids

ARTICLE 5 CONSIDERATION OF BIDS

Paragraph 5.1 Opening of Bids:

Delete in its entirety and substitute the following:

"If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be recorded and a summary of the bids may be made available to the Bidders in Horry County's electronic bidding software, BidNet within sixty (60) minutes of bid opening."

Paragraph 5.3.1 Acceptance of Bid (Award)

Add the following: "...in any bid received, when such waiver or rejection is in the best interest of the Owner and to award the job in the best interest of the Owner.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

Paragraph 7.1.5 - Add the following:

"§7.1.5 The successful contractor shall be required to furnish Performance Bond in the sum of 100% of the contract amount, and a Labor and Materials Payment Bond in the sum of 100% of the contract amount. Bonds shall be issued on Document A312, current edition, published by the American Institute of Architects, and shall be written by a Surety Company licensed in South Carolina, with an "A" minimum rating of performance as stated in the most current publication of "Best's Key Rating Guide, Property Liability", which shall show a financial strength rating of at least five times the contract price. Each bond shall be accompanied by a "Power of Attorney" authorizing the attorney-in-fact to bind the surety and certified to include the date of the bond."

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

Exhibits have been omitted from AIA Document A701™-2018 Instruction to Bidders as they will be inclusive of AIA Document A101™ - 2017, Standard Form of Agreement Between Owner and Contractor when issued to Awarded Contractor.

END OF DOCUMENT 00200



AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

A New Building Replacement For:
Finklea Fire Station #6
Horry County, SC

THE OWNER:

(Name, legal status and address)

Horry County
307 Smith Street
Conway, SC 29526

THE ARCHITECT:

(Name, legal status and address)

CROFT & Associates SC, LLC dba: PMH CROFT
1300 Professional Drive, Suite 201
Myrtle Beach, SC 29577

TABLE OF ARTICLES

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ADDITIONS AND DELETIONS:

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

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

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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14 **TERMINATION OR SUSPENSION OF THE CONTRACT**

15 **CLAIMS AND DISPUTES**



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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

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

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

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

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

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

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

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

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

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and

delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will

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

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

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

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

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

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

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

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

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

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

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

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

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

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

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

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

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

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

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

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

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

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

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

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

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

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

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

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

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

§ 9.4 Certificates for Payment

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

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

§ 9.5 Decisions to Withhold Certification

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

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

- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

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

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

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will

promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

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

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

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act

or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

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

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

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

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The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

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

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and

approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

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

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

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

§ 14.3 Suspension by the Owner for Convenience

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

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

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

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

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

§ 15.2 Initial Decision

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

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

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

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

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

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

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

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

§ 15.3 Mediation

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

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

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

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

§ 15.4 Arbitration

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

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

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

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

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

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

SECTION 00800 – SUPPLEMENTARY CONDITIONS

GENERAL CONDITIONS

The "General Conditions of the Contract for Construction", AIA Document A201, Sixteenth Edition, 2017, Articles 1 through 15 inclusive, is part of this contract.

SUPPLEMENTS

The following supplements modify, delete and/or add to the General Conditions. Where any article, paragraph or subparagraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such article, paragraph, or subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any article, paragraph or subparagraph in the General Conditions is amended, voided, or superseded by any of the following paragraphs, the provisions of such article, paragraph or subparagraph not so amended, voided, or superseded shall remain in effect.

GENERAL

Wherever the word "Architect" appears in the General Conditions substitute therefor: "Architect/Engineer".

ARTICLE 1 - GENERAL PROVISIONS

Add the following:

- 1.1.1.1 The Contractor's Bid shall be part of the Contract Documents.
- 1.1.2.1 Form of Agreement shall be Standard Form of Agreement Between Owner and Contractor, AIA Document Number A101, Current Edition.
- 1.2.1.2 In the event of conflict between the specifications and drawings, the provisions of the specifications shall govern.

ARTICLE 2 - OWNER

Modify as follows:

- 2.1.1 Last line delete "authorized" and substitute therefor "designated".

Add the following:

- 2.3.4.1 The Owner shall pay any building permit (refer to Section 01020-Allowances), sewer and water impact and tap fees directly to such agencies. Contractor shall notify Owner sufficiently in advance of installation schedule for these items to insure payment of such fees is processed promptly.
- 2.3.6 Delete in its entirety and substitute therefor the following:
- 2.3.6 The Contractor will be furnished, free of charge, eight (8) copies of the Drawings and Specifications and will be furnished, at actual cost of reproduction, as many additional copies as he may require.

ARTICLE 3 - CONTRACTOR

Add the following:

- 3.2.1.1 The following principles shall govern the settlement of disputes which may arise over discrepancies in the contract documents: (a) as between figures given on drawings and the scaled measurements, the figures shall govern - no measurements should be taken by scale as

working dimensions except on large-scale drawings not dimensioned in detail; (b) as between large-scale drawings and small-scale drawings, the larger scale shall govern; (c) as between drawings and specifications, requirements of the specifications shall govern; and (d) as between the Form of Agreement and the Specifications, requirements of the Form of Agreement shall govern. The principles set forth herein shall not alter provisions of Article I, paragraph 1.2.

- 3.6.1 Contractor shall hold Owner and his agents harmless against any claim or liability from pertinent clauses of State Law.
- 3.6.2 The Contractor's attention is directed to Title 12, Chapter 9, Code of laws of South Carolina 1976 as amended concerning withholding tax for non-residents, employees, contractors and subcontractors.
- 3.7.1.1 In order that the inspection services of municipal or county building departments might be made available for plumbing, heating, air conditioning, and electrical work the Contractor shall require that each subcontractor for these specialty contracts apply for, obtain, and pay the cost of a permit and inspection fees for that specialty for which he is a subcontractor; provided that this project is to be constructed within a municipality or county offering such services.
- 3.9.2 Delete in its entirety and substitute therefor the following:
- 3.9.2 The General Contractor shall provide a designated Project Superintendent and submit the Superintendent's resume for approval by the Architect and Owner. The Superintendent must have a minimum of 10 years experience in the same or higher position on projects similar to this project in scope and size, and must be familiar with all aspects of: on-site project coordination, scheduling, safety, submittal review and coordination, and Quality Control as specified in the Contract Documents. All Project Meetings will be conducted by the Project Superintendent, who will be responsible for recording and distributing minutes of the Project Meetings. Changes to the designated Project Superintendent must be approved by the Architect and Owner.

Add the following:

- 3.9.4 Major Subcontractors (Mechanical, Electrical, Plumbing, Fire Sprinkler, Sitework, Concrete, Masonry, Steel Framing, Metal Framing, Roofing, Ceiling, Drywall, and Painting) shall provide a designated Superintendent with 5 years experience in that trade, and the Superintendent must be familiar with project coordination, scheduling, safety, and the Quality Control procedures specified in the Contract Documents. This designated Subcontractor Superintendent must be on-site during all associated subcontractor activities, and must attend all Project Meetings associated with that Subcontractor's scope of work.
- 3.10.1.1 This schedule shall indicate the dates for the starting and completion of various stages of construction and shall be revised monthly as required by the conditions of the work.
- 3.14.3 It is Contractor's duty to coordinate with his subcontractors in advance so that pipe holes, sleeves, inserts, etc., can be installed as work progresses.
- 3.18.3 The Contractor shall not allow the use of asbestos containing products, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work, even if the products are nonfriable and/or contain minimal amounts of asbestos, and even though such products may still be legally installed.
- 3.18.4 The Contractor shall not allow the use of lead materials in public water applications. "Lead Free" solder, flux and pipe must be used in all public drinking water applications as outlined in the 1986 Amendments to the Safe Drinking Water Act. "Lead Free" solder and flux are defined as containing less than 0.2% lead, while valves, pipes and appurtenances must contain less than

8.0% lead.

ARTICLE 4 - ARCHITECT

Add the following:

- 4.2.1.1 In the Specifications or on the Drawings, where the words "as directed", "as required", "as approved", "as permitted" or words of like effect are used, Contractor shall understand that direction, requirement, approval or permission of Architect/Engineer is intended. Similar words "approved", "acceptable", "satisfactory", or words of like importance mean approved by, acceptable to or satisfactory to Architect/Engineer.

Modify as follows:

- 4.2.1 First line following "-----provide", add "general".
- 4.2.10 Delete in its entirety and substitute therefor the following:
- 4.2.10 If a Project Representative is provided, his duties, responsibilities and limitations of authority shall be as set forth in STANDARD FORM OF ARCHITECT'S SERVICES: ON-SITE PROJECT REPRESENTATION, AIA DOCUMENT B207 – 2017 or latest edition, copy of which will be provided to Owner, Contractor and Project Representative.

ARTICLE 5 - SUBCONTRACTORS

Add the following:

- 5.3.1 The Contractor shall assure the Owner, by affidavit or in such other manner as the Owner may approve, that all agreements between the Contractor and his Subcontractors incorporate the provisions of subparagraph 5.3 as necessary to preserve and protect the rights of the Owner and the Architect/Engineer under the Contract Documents with respect to the work to be performed by Subcontractors so that the subcontracting thereof will not prejudice such rights.

ARTICLE 7 - CHANGES IN THE WORK

Add the following:

- 7.1.1.1 Change Orders are effective only after approval by the Owner and the Architect.
- 7.1.4 In determining the cost or credit to the Owner resulting from a change in the work, the allowances for overhead and profit combined, included in the total cost to the Owner, shall not exceed the percentages herein scheduled, as follows:
1. For Prime Contractor, for any work performed by his own forces, 15% of the cost;
 2. For each Subcontractor involved, work performed by his own forces, 15% of the cost;
 3. For the Prime Contractor, for work performed by his Subcontractor, 7% of the amount due the Subcontractor.
- 7.3.7.1 The "cost" as used herein may include all items of labor or materials, the use of power tools and power equipment and all such items of cost as public liability, workmen's compensation insurance, pro rata charges for additional time of foreman, social security, and old age and unemployment insurance other than that mentioned above, supervision, travel, superintendence, timekeepers, clerks, watchmen, small tools, incidental job burdens and general office expense, and all other items not included in the cost as defined above.

ARTICLE 8 - TIME

Modify as follows:

8.3 Delete in its entirety and substitute therefor the following:

8.3 Delay and Extension of Time

8.3.1 Completion time stipulated under other sections of the Contract Documents may be extended by Change Order to provide one additional work day for each full work day that the Contractor is prevented from working by reason of one or more of the following causes:

1. Unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not limited to, catastrophes and/or acts of God, acts of another Contractor in the performance of a separate Contract with the Owner, epidemics, quarantine restrictions, strikes or freight embargoes;
2. An unusual amount of severe weather to such an extent as to be definitely abnormal and beyond conditions that may be reasonably anticipated. For the purpose of this contract, a total of three (3) working days per calendar month shall be anticipated as "normally bad or severe weather", and such time will not be considered justification for an extension of time.
3. Stoppage of work ordered by Owner or Architect/Engineer for reasons over which Contractor has no control.

The Contractor shall, within ten (10) days after the beginning of such delay notify the Owner and Architect/Engineer in writing of the cause of the delay. The contractor shall include with time extension request just cause indicating how delay has affected critical path sequence of construction activities. The Architect/Engineer will then ascertain the facts and extent of delay, and notify the Contractor within (10) days of the Owner's decision in the matter. Notice of delay and requests for extension of time shall set forth the cause and number of additional working days contractor desires contract extended.

8.3.2 No claims for extension of time will be considered when based on delays caused by conditions existing at the time bids were received, and of which the contractor might be reasonably expected to have full knowledge at the time of bidding, or upon delays caused by failure on the part of the contractor to anticipate properly the requirements of the work contracted for as to materials, labor and equipment. All claims for extension of time shall be made in writing to the Architect/Engineer with the next application for payment; otherwise they shall be waived.

8.3.3 Completion date stipulated under other sections of the Contract Documents may be extended by Change Order to compensate for additional work that may be ordered by Owner, provided such work is over and beyond scope of work covered by original contract and is of such nature as to materially affect date of completion.

ARTICLE 9 - PAYMENT AND COMPLETION

Modify as follows:

9.3.1 Third line following "notarized", delete "if required".

Add the following:

9.3.1.3 The Architect/Engineer will authorize, as provided in Paragraphs 9.4 and 9.5, monthly payments equal to ninety (90%) percent of the portion of the contract sum properly allocable to labor, material and equipment incorporated in the work, and allocable to material and equipment suitably stored.

- 9.3.1.4 Contractor's Application for Payment, required for each project separately of a multi-project contract, shall be on Forms furnished by Architect/Engineer which shall include the following statement:

Undersigned Contractor certifies by this Application for Payment has been completed in accordance with Contract Documents, that all amounts have been paid by him for Work for which previous Certificates for Payment were issued and payments received from Owner, and that current payment shown herein is now due.

Contractor:

By: _____ Date: _____

Subscribed and sworn to before me this:

Notary Public:

My Commission Expires: _____ Date: _____

Add the following:

- 9.3.2.1 Rental equipment such as, but not limited to, mobile equipment, pans, forms, scaffolding, compressors, etc., shall not be considered material stored.
- 9.6.2.1 The Contractor's attention is directed to Title 29, Chapter 7, Code of Laws of South Carolina, 1976, as amended, concerning labors' liens.
- 9.6.2.2 Release of retained funds: When the work to be performed on a state construction contract is to be performed by multiple prime contractors or by a prime contractor and multiple subcontractors, the work contracted to be done by each individual contractor or subcontractor will be considered a separate division of the contract for the purpose of retention. As each such division of the contract is certified as having been completed, that portion of the retained funds which is allocable to the completed division of the contract shall be released forthwith to the prime contractor, who shall, within ten days of its receipt, release to the subcontractor responsible for the complete work the full amount of any retention previously withheld from him by the prime contractor.
- 9.7.1 Nonresident contractor's attention is directed to Title 12, Chapter 9, Code of Laws of South Carolina 1976, as amended, concerning withholding tax on nonresident employees, contractors and subcontractors.

Add the following:

- 9.10.1.1 When the contractor is ready for final inspection, he shall give notice to the Architect/Engineer with a copy to the Owner in the following words:

The work on the contract for (show name of improvement or project as it appears in the Form of Agreement), having been fully completed, except as stipulated herein below, it is requested that a final inspection be made promptly by the Architect. The following work is incomplete through no fault or negligence of the Contractor: (List any work the contractor regards as exceptionable and after each item substantiate why its incompleteness is not due to his fault or negligence). No final inspection shall be made until such time as the Architect/Engineer and the Owner have received a letter in exact form indicated above.

- 9.10.2.1 Contractor shall submit to Architect/Engineer Contractor's Affidavit of Payment of Debts and Claims on AIA Document G706, latest edition, together with all supporting documents as called

for thereon, including (as applicable):

1. Consent of Surety to Final Payment on AIA document G707, latest edition.
2. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment. Submit in letter form under Contractor's letterhead.
3. Separate Releases or Waivers of Liens from all Subcontractors and Materials and
4. Equipment Suppliers on reproduction of form supplied by Architect/Engineer in contract documents. Accompany with a list thereof.
5. Contractor's Affidavit of Release of Liens on AIA Document G706A, latest edition.

9.10.3.1 The balance payable under conditions stated shall reflect retainage for thrice the value of uncompleted work, as determined by the Architect/Engineer, but not more than 10% of the contract amount.

ARTICLE 11 - INSURANCE AND BONDS

Delete Article in its entirety and substitute therefor the following:

ARTICLE 11 - INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 The Contractor shall purchase and maintain in a company or companies acceptable to the Owner such insurance as will protect him from claims set forth below which may arise out of or result from the Contractor's operations under the Contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by any of them or by anyone for whose acts any of them may be liable.

1. Claims under workers' or workmen's compensation, disability benefit and other similar employee benefit acts;
2. Claims for damages because of bodily injury, occupational sickness or disease, or death of his employees;
3. Claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees;
4. Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person;
5. Claims for damages, other than to the work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom; and
6. Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than any limits of liability specified in the contract documents, or required by law, whichever is greater.

11.1.2.1 Minimum limits of liability for following types of insurance are required (B.I.= Bodily Injury; P.D.= Property Damage; Limits are shown in thousands of dollars).

1. Workmen's Compensation, including:
 - a. Workmen's Compensation Insurance-Statutory
 - b. Employers' Liability -100 each occurrence form
2. Comprehensive General Liability, including:

- a. Premises and Operations, 1000 B.I.; 250 P.D.
 - b. Contractual/Owner's Liability, 1000 B.I.; 250 P.D.
 - c. Contractor's Protective Liability, 1000 B.I.; 250 P.D.
 - d. Products Liability, including Completed Operations Coverage, 1000 B.I.; 250 P.D.
- 3. Comprehensive Automobile Liability, including:
 - a. All owned Automobiles, 1000 B.I.; 250 P.D.
 - b. Non-owned Automobiles, 1000 B.I.; 250 P.D.
 - c. Hired Car Coverage, 1000 B.I.; 250 P.D.
- 11.1.2.2 In addition to Contractual Liability including indemnification provision Bodily Injury and Property Damage coverage under both Comprehensive General and Comprehensive Automobile forms shall include "occurrence" basis wording, which means an event, or continuous or repeated exposure to conditions which unexpectedly causes injury or damage during policy period.
- 11.1.2.3 Contractor shall either (a) require each of his Subcontractors to procure and maintain during the life of his contract, Subcontractors Comprehensive General Liability Insurance, Automobile Liability, and Property Damage Liability Insurance of the type and in the same amounts as specified in this Subparagraph, or (b) insure the activities of his Subcontractors in his own policy.
- 11.1.3 The insurance required by Subparagraph 11.1.1 shall include contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.
- 11.1.3.1 CERTIFICATE OF INSURANCE MUST BE FILED THROUGH ARCHITECT/ENGINEER ON AIA DOCUMENT G715 – 2017 or LATEST EDITION, by an insurer authorized to do business in South Carolina by South Carolina State Insurance Commission. All blanks and questions on Certificate must be filled out completely. Incomplete or inadequate certificate will be returned to Contractor as unsatisfactory and commencement of his work will be delayed until satisfactory certificate is submitted. Such delay will not warrant extension of contract time.
- 11.1.4 Certificates of Insurance acceptable to Owner shall be filed with the Owner prior to commencement of the work. These certificates shall contain a provision that coverage afforded under the policies will not be canceled until at least thirty days prior written notice has been given to the Owner.
- 11.2 OWNER'S LIABILITY INSURANCE
- 11.2.1 The Contractor shall be responsible for purchasing and maintaining complete Owner's Protective Liability Insurance covering claims which may arise from operations under the Contract. The Contractor shall file a copy of all Owner's protective liability insurance policies with the Owner before any exposure to loss may occur. Limits shall be the same as specified for general liability and property damage insurance.
- 11.3 PROPERTY INSURANCE
- 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain property insurance upon the entire work at the site to the full insurable value thereof. This insurance shall include the interests of the Owner, the Contractor, Subcontractors, Sub-subcontractors in the work and shall insure against the perils of fire, extended coverage, vandalism, glass breakage and malicious mischief. A deductible of \$100.00 shall apply to each loss resulting from vandalism, glass breakage and malicious mischief. The deductible shall be borne by the Contractor. This insurance does not cover any tools owned by mechanics, any tools, equipment, scaffolding, staging towers and forms owned or rented by the Contractor which are not intended to become part of the project. This insurance shall also not cover any loss by theft or burglary, or damage to the building or contents

as a result of said theft or burglary. The interest of the Owner, the Contractor, Subcontractors, Sub-subcontractors in this insurance shall only be effective during the construction of the project and all rights and interest of the Contractor, Subcontractors in this insurance shall only be effective during the construction of the project and all rights and interest of the Contractor, Subcontractor, and Sub-subcontractors in this insurance shall end upon the acceptance of the project by the Owner.

- 11.3.2 The Owner shall purchase and maintain such boiler and machinery insurance as may be required by the Contract Documents or by Law. This insurance shall include the interest of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the work. The interest of the Contractor, Subcontractors and Sub-subcontractors in this insurance shall only be during the time of the construction of the project and all rights and interest in this insurance shall end upon acceptance of the project by the Owner.
- 11.3.3 Any insured loss is to be adjusted with the Owner and made payable to the Owner as trustee for the insured, as their interests may appear, subject to the requirements of any applicable mortgage clause.
- 11.3.4 The Owner shall file a certificate of all policies with the Contractor before an exposure to loss may occur. If the Owner does not intend to purchase such insurance, he shall inform the Contractor in writing prior to commencement of the work. The Contractor then shall effect insurance which shall protect the interest of himself, his subcontractors and the sub-subcontractors in the work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure of the Owner to purchase or maintain such insurance and so notifies the Owner, then the Owner shall bear all reasonable cost appropriately attributable thereto.
- 11.3.5 If the Contractor requests in writing that insurance for special hazards be included in the Property Insurance Clause, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.
- 11.3.6 The Owner and Contractor waive all rights against each other for damages caused by fire and other perils to the extent covered by insurance provided under Paragraph 11.3 except such rights as they may have to the proceeds of such insurance held by the Owner as trustee. The Contractor shall require similar waivers by Subcontractors and Sub-subcontractors in accordance with clause 5.3.1.1. This waiver does not apply to any defects due to faulty material or workmanship by the Contractor. The Subcontractors or Sub-subcontractors and the Contractor shall remedy any defects due to such faulty materials or workmanship and pay for any damage to other work resulting therefrom, which shall appear within a period of one year from the date of acceptance as defined in the general conditions and in accordance with the terms of any special guarantees provided in the contract. The Owner shall give notice of observed defect within ninety days of the time they were observed or should have been observed.
- 11.3.7 If required in writing by any party in interest, the Owner as trustee shall, upon the occurrence of an insured loss, deposit in a separate account any money received for such loss, and he shall distribute it in accordance with such agreement as the parties in interest may reach. If after such loss no other special agreement is made, replacement of damaged work shall be covered by an appropriate Change Order.
- 11.3.8 The Owner as trustee shall have the power to adjust and settle with the insurers.
- 11.3.9 If the Owner finds it necessary to occupy or use a portion or portions of the work prior to substantial completion thereof, such occupancy shall not commence prior to a time mutually agreed to by the Owner and Contractor and to which the insurance company or companies providing the property insurance shall not be canceled or lapsed on account of such partial

occupancy. Consent of the Contractor and of the insurance company or companies to such occupancy or use shall not be unreasonably withheld.

- 11.3.10 Any wall or steel construction during this period of coverage must be properly braced, regardless of plans or specifications otherwise, to prevent damage from wind. Any alleged damage must be inspected by a Representative of the Fund, prior to any cleaning or repair. Liability will not be accepted by the Fund if provisions of this Endorsement are not complied with.
- 11.4.1 Delete in its entirety and substitute therefor the following:
- 11.4.1 A Performance Bond and Labor and Material Payment Bond are required. The Contractor shall obtain a Performance Bond and Labor and Material Payment Bond, acceptable to the Owner in a surety company authorized to do business in the state in which the Project is constructed. The Performance Bond shall be in an amount equal to One Hundred Percent (100%) of the full amount of the Contract Sum as security for the faithful performance of the Contract Documents, and the Labor and Material Payment Bond shall be in an amount equal to One Hundred Percent (100%) of the full amount of the Contract Sum as security for the payment of all persons performing labor and furnishing materials in connection with the Contract Documents. Such bonds shall be on forms approved by the Owner and shall name the Owner as a primary co-obligee. The bonds shall guarantee the Contractor's faithful performance of the Contract and the payment of all obligations arising thereunder. The bonds shall remain in force until (1) the Project has been completed and accepted by the Owner, (2) the provisions of all guarantees required by these Contract Documents have been fulfilled, and the time limitation for all guarantees has expired, or (3) until the time for the filing of all mechanic's liens has expired, whichever is longer, after which it shall become void. The Contractor shall pay all changes in connection with these bonds as a part of the Contract. One executed copy of the bonds shall be attached to each copy of the Contract before they are returned to the Architect for the Owner's signature. These bonds shall be written on AIA Document A312, latest edition. A current Power of Attorney shall be attached to each bond.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

Add the following:

- 13.1.1 By executing a contract for the Project the Contractor agrees to submit itself to the jurisdiction of the courts of the State of South Carolina for all matters arising or to arise hereunder, including but not limited to performance of said contract and payment of all licenses and taxes of whatever nature applicable thereto.
 - 13.4.2.1 Materials subject to test shall be inspected by a testing agency selected by the Architect/Engineer and satisfactory to the Owner. The Contractor shall defray the cost of tests conducted pursuant to laws, ordinances, rules, regulations or orders of any public authority having jurisdiction; the cost of test conducted for his own information and in his own interest; and the cost of tests which are named in the Technical Sections of the Specifications as tests to be paid for by the Contractor.
- 13.6 REGULATORY REQUIREMENTS
- 13.6.1 Compliance with EEOC and other State and Federal Laws: To the extent set forth in the respective statutes, Provider shall comply with the provisions of:
 - 13.6.2 Title VII of the Civil Rights Act of 1964;
 - 13.6.3 Age Discrimination in Employment Act of 1967;
 - 13.6.4 Title I of the Americans with Disabilities Act of 1990;

- 13.6.5 Equal Pay Act of 1963;
- 13.6.6 Fair Labor Standards Act of 1938;
- 13.6.7 Immigration Reform and Control Act of 1986; and
- 13.6.8 South Carolina Wages Act, S.C. Code § 37-10-10 *et seq.*.
- 13.6.9 South Carolina Worker's Compensation Act, S.C. Code § 42-1-10 *et seq.*
- 13.6.10 South Carolina Illegal Immigration Reform Act, including without limitation Chapters 14 & 29, Title 8, and Chapter 8, Title 41, S.C. Code of Laws.
- 13.6.11 Part 681, Title 16 of the Code of Federal Regulations, Sections 114 and 315 of the Fair and Accurate Credit Transactions Act (FACTA) of 2003; the South Carolina Act 190 of 2008; Financial and Identity Theft Protection Act; and the Horry County Privacy / Identity Theft Policy.

ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

Add the following:

- 14.3.2.3 that extended overhead exceeds five working days when the Owner in writing stops work for his convenience or a natural disaster. Extended overhead is denied for change orders, change directives, and other delays.

ARTICLE 15 – CLAIMS AND DISPUTES

Add the following:

- 15.2.9 Any controversy or claim arising out of or related to the Contract or the breach thereof will be settled in accordance with the laws of the State of South Carolina.
- 15.3 Delete in its entirety and substitute therefor the following:
- 15.4 Delete in its entirety and substitute therefor the following:

Article 15.3 Mediation/Arbitration

- 15.3.1 Disputes Resolutions: All claims, disputes, and other matters in questions between the parties to this Agreement, arising out of or relating to this Agreement or the breach thereof, shall be tried before a Circuit Judge or Master in Equity of Horry County without a jury. The contractor hereby waives its right to a jury trial and agrees that the venue of the action will be in Horry County, South Carolina. Any legal proceedings arising out of or relating to this Agreement shall include, by consolidation, joinder or joint filing, any additional person or entity not a party to this agreement to the extent necessary to the final resolution of the matter in controversy. Owner shall include the same disputes resolution and consolidation provisions in the owner's contractor (or construction manager) agreement and shall provide that similar provisions be included in contractor or subcontractor agreements.

END OF SUPPLEMENTARY CONDITIONS 00750

SECTION 01010 – SUMMARY OF WORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Project consists of A New Building Replacement for Finklea Fire Station #6
- B. Project location is 3421 SC-917, Loris, South Carolina, 29569
- C. Contract Documents, dated August 2024 were prepared for the Project by PMH/Croft 1300 Professional Drive, Suite 201, Myrtle Beach, SC 29577.
- D. The Work includes:
 - 1. The Work includes pre-engineered steel structures, slab on grade floor and spread footing foundations. The exterior consists of masonry, brick, EIFS, and metal siding with prefinished aluminum windows, metal roof, interior CMU and metal stud partitions with painted gypsum board finish, suspended acoustical and gypsum board ceiling systems, poured epoxy and LVP flooring and other various finishes. The facility shall be provided with a fire suppression system throughout. Facility will be connected to public water and sewer. The Work also includes structural, plumbing, fire sprinkler, mechanical, electrical, civil, and landscaping.
 - 2. Base Bid is for a 3-truck bay Fire Station.
 - 3. Alternate #1 is for the addition of a 4th truck bay.
- E. General: The Contractor's use of the premises is limited only by the Owner's right to perform work or to retain other contractors on portions of the Project. Project is located on County property.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01010

SECTION 01020 – ALLOWANCES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing allowances.
 - 1. Selected materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01035 "Modification Procedures" specifies procedures for submitting and handling Change Orders.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise the Architect of the date when the final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At the Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by the Architect from the designated supplier.

1.4 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- B. Submit invoices or delivery slips to show the actual quantities of materials delivered to the site for use in fulfillment of each allowance.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly upon delivery for damage or defects.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Building Permit

1. The Contractor shall allow the sum of Three Thousand, Five Hundred Dollars (\$3,500.00) each station in the Base Bid for the cost of a building permit to be issued by the Building Department.

END OF SECTION 01020

SECTION 01027 – APPLICATIONS FOR PAYMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Schedules: The Contractor's Construction Schedule and Submittal Schedule are specified in Division 1 Section 01300 - "Submittals" and Section 01311 – "Schedules and Reports".

1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
 - a. Contractor's Construction Schedule.
 - b. Application for Payment forms, including Continuation Sheets.
 - c. List of subcontractors.
 - d. Schedule of allowances.
 - e. Schedule of alternates.
 - f. List of products.
 - g. List of principal suppliers and fabricators.
 - h. Schedule of submittals.
 - 2. Submit the Schedule of Values to the Architect at the earliest possible date but no later than 7 days before the date scheduled for submittal of the initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish the format for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of the Architect.
 - c. Project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.

- b. Description of Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
- 1) Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
- 3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Break principal subcontract amounts down into several line items.
 - 4. Round amounts to nearest whole dollar; the total shall equal the Contract Sum.
 - 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.
 - 6. Provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 - 7. Margins of Cost: Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at the Contractor's option.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner.
 - 1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.
- B. Payment-Application Times: The date for each progress payment is the 25th day of each month. The period covered by each Application for Payment starts on the day following the end of the preceding period and ends 15 days prior to the date for each progress payment.
- C. Payment-Application Forms: Use AIA Document G702 and Continuation Sheets G703 as the form for Applications for Payment.
- D. Application Preparation: Complete every entry on the form. Include notarization and execution by a person authorized to sign legal documents on behalf of the Contractor. The Architect will return incomplete applications without action.
 - 1. Entries shall match data on the Schedule of Values and the Contractor's Construction Schedule. Use updated schedules if revisions were made.
 - 2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

- E. Transmittal: Submit 1 signed and notarized original copy of each Application for Payment to the Architect electronically. One copy shall be complete, including waivers of lien and similar attachments, when required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the Architect.
- F. Waivers of Mechanics Lien: With the Final Application for Payment, submit waivers of mechanics lien from every entity who is lawfully entitled to file a mechanics lien arising out of the Contract and related to the Work covered by the payment.
- G. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal of the first Application for Payment, include the following:
1. List of subcontractors.
 2. List of principal suppliers and fabricators.
 3. Schedule of Values.
 4. Contractor's Construction Schedule (preliminary if not final).
 5. Schedule of principal products.
 6. Schedule of unit prices.
 7. Submittal Schedule (preliminary if not final).
 8. List of Contractor's staff assignments.
 9. List of Contractor's principal consultants.
 10. Copies of building permits.
 11. Copies of authorizations and licenses from governing authorities for performance of the Work.
 12. Initial progress report.
 13. Report of preconstruction meeting.
 14. Certificates of insurance and insurance policies.
- H. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment.
1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
 2. Administrative actions and submittals that shall precede or coincide with this application include:
 - a. Occupancy permits and similar approvals.
 - b. Warranties (guarantees) and maintenance agreements.
 - c. Test/adjust/balance records.
 - d. Maintenance instructions.
 - e. Meter readings.
 - f. Startup performance reports.
 - g. Changeover information related to Owner's occupancy, use, operation, and maintenance.
 - h. Final cleaning.
 - i. Application for reduction of retainage and consent of surety.
 - j. Advice on shifting insurance coverages.
 - k. Final progress photographs.
 - l. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.
- I. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:

1. Completion of Project closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. Ensure that unsettled claims will be settled.
4. Ensure that incomplete Work is not accepted and will be completed without undue delay.
5. Transmittal of required Project construction records to the Owner.
6. Removal of temporary facilities and services.
7. Removal of surplus materials, rubbish, and similar elements.
8. Change of door locks to Owner's access.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01027

SECTION 01035 – MODIFICATION PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing contract modifications.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01027 "Applications for Payment" for administrative procedures governing Applications for Payment.
 - 2. Division 1 Section 01270 "Unit Prices" for administrative requirements governing use of unit prices.
 - 3. Division 1 Section 01300 "Submittals" for requirements for the Contractor's Construction Schedule.
 - 4. Division 1 Section 01631 "Substitutions" for administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 MINOR CHANGES IN THE WORK

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

1.4 CHANGE ORDER PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: The Architect will issue a detailed description of proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal requests issued by the Architect are for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.
 - 2. Within 20 days of receipt of a proposal request, submit an estimate of cost necessary to execute the change to the Architect for the Owner's review.
 - a. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
- B. Contractor-Initiated Proposals: When latent or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.

1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
2. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Comply with requirements in Section "Substitutions" if the proposed change requires substitution of one product or system for a product or system specified.

C. Proposal Request Form: Use AIA Document G709 for Change Order Proposal Requests.

1.5 ALLOWANCES

- A. Allowance Adjustment: For allowance-cost adjustment, base each Change Order Proposal on the difference between the actual purchase amount and the allowance, multiplied by the final measurement of work-in-place. Where applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 1. Include installation costs in the purchase amount only where indicated as part of the allowance.
 2. When requested, prepare explanations and documentation to substantiate the margins claimed.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or the Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. The Owner will reject claims submitted later than 21 days.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: When the Owner and the Contractor disagree on the terms of a Proposal Request, the Architect may issue a Construction Change Directive on AIA Form G714. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. The Construction Change Directive contains a complete description of the change in the Work. It also designates the method to be followed to determine change in the Contract Sum or Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.7 CHANGE ORDER PROCEDURES

- A. Upon the Owner's approval of a Proposal Request, the Architect will issue a Change Order for signatures of the Owner and the Contractor on AIA Form G701.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01035

SECTION 01040 – COORDINATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:
 - 1. General project coordination procedures.
 - 2. Conservation.
 - 3. Coordination Drawings.
 - 4. Administrative and supervisory personnel.
 - 5. Cleaning and protection.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01050 "Field Engineering" specifies procedures for field engineering services, including establishment of benchmarks and control points.
 - 2. Division 1 Section 01200 "Project Meetings" for progress meetings, coordination meetings, and preinstallation conferences.
 - 3. Division 1 Section 01300 "Submittals" for preparing and submitting the Contractor's Construction Schedule.
 - 4. Division 1 Section 01600 "Materials and Equipment" for coordinating general installation.
 - 5. Division 1 Section 01750 "Contract Closeout" for coordinating contract closeout.

1.3 COORDINATION

- A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
 - 3. Make provisions to accommodate items scheduled for later installation.
 - 4. Schedule and coordinate "pre-installation" conferences as referenced throughout other sections of these specifications and as necessary to coordinate installation and interfacing of work with all other work prior to installation of work, refer to Specification Section 01200 "Project Meetings".
- B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of schedules.
 2. Installation and removal of temporary facilities.
 3. Delivery and processing of submittals.
 4. Progress meetings.
 5. Project closeout activities.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare coordination drawings where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.
1. Show the relationship of components shown on separate Shop Drawings.
 2. Indicate required installation sequences.
 3. Comply with requirements contained in Section 01300 "Submittals"
- B. Staff Names: Within 15 days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.
1. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

- A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

- B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.
- C. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
 - 1. Excessive static or dynamic loading.
 - 2. Excessive internal or external pressures.
 - 3. Excessively high or low temperatures.
 - 4. Thermal shock.
 - 5. Excessively high or low humidity.
 - 6. Air contamination or pollution.
 - 7. Water or ice.
 - 8. Solvents.
 - 9. Chemicals.
 - 10. Light.
 - 11. Radiation.
 - 12. Puncture.
 - 13. Abrasion.
 - 14. Heavy traffic.
 - 15. Soiling, staining, and corrosion.
 - 16. Bacteria.
 - 17. Rodent and insect infestation.
 - 18. Combustion.
 - 19. Electrical current.
 - 20. High-speed operation.
 - 21. Improper lubrication.
 - 22. Unusual wear or other misuse.
 - 23. Contact between incompatible materials.
 - 24. Destructive testing.
 - 25. Misalignment.
 - 26. Excessive weathering.
 - 27. Unprotected storage.
 - 28. Improper shipping or handling.
 - 29. Theft.
 - 30. Vandalism.

END OF SECTION 01040

SECTION 01050 – FIELD ENGINEERING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. General: This Section specifies administrative and procedural requirements for field-engineering services including, but not limited to, the following:
 - 1. Land survey work.
 - 2. Civil-engineering services.
 - 3. Damage surveys.
 - 4. Geotechnical monitoring.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Coordination" for procedures for coordinating field engineering with other construction activities.
 - 2. Division 1 Section "Submittals" for submitting Project record surveys.
 - 3. Division 1 Section "Contract Closeout" for submitting final property survey with Project Record Documents and recording of Owner-accepted deviations from indicated lines and levels.

1.3 SUBMITTALS

- A. Certificates: Submit a certificate signed by the land surveyor or professional engineer certifying the location and elevation of improvements.
- B. Final Property Survey: Submit 1 copy of the final property survey.
- C. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of "Submittals" and "Contract Closeout" Sections.

1.4 QUALITY ASSURANCE

- A. Surveyor Qualifications: Engage a land surveyor registered in the state where the Project is located, to perform required land-surveying services.
- B. Engineer Qualifications: Engage an engineer of the discipline required, licensed in the state where the Project is located, to perform required engineering services.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Identification: Identify existing control points and property line corner stakes.

- B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks, before proceeding to lay out the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.
 - 1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.
 - 2. Promptly replace lost or destroyed Project control points. Base replacements on the original survey control points.
- C. Establish and maintain a minimum of 2 permanent benchmarks on the site, referenced to data established by survey control points.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- D. Existing Utilities and Equipment: 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.
 - 1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping.

3.2 PERFORMANCE

- A. Work from lines and levels established by the property survey. Establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.
 - 1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
 - 2. As construction proceeds, check every major element for line, level, and plumb.
- B. Surveyor's Log: Maintain a surveyor's log of control and other survey work. Make this log available for reference.
 - 1. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.
- C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels, and control lines and levels required for mechanical and electrical work.
- E. Existing Utilities: Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines, services, or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.
- F. Final Property Survey: Prepare a final property survey showing significant features (real property) for the Project. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey.

END OF SECTION 01050

SECTION 01060 – REGULATORY REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The following requirements of Regulatory Agencies having an interest in this project are hereby made a part of this Contract.
- B. The construction of the project, including the letting of contracts in connection herewith, shall conform to the applicable requirements of State, territorial, and local laws and ordinances to the extent that such requirements do not conflict with Federal laws and this subchapter.
- C. South Carolina Sales Tax: All applicable South Carolina sales tax shall be to the account of the Contractor.
- D. Use of Chemicals: All chemicals used during the project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with instructions.
- E. Safety and Health Regulations: The Contractor shall comply with the Department of Labor and Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL-91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL-91-54).
- F. Inspection by Agencies: The representatives of the South Carolina Department of Health and Environmental Control, Horry County and Department of Highways and Public Transportation and where applicable, municipalities in which a project is located, shall have access to the work wherever it is, in preparation or in progress, and the Contractor shall provide proper facilities for such access and inspection.
- G. Withholding for Non-Residents shall comply with the following:
 - 1. Attention of non-resident contractors is invited to Part Two, Act No. 855. Acts of the General Assembly of South Carolina 1958.
 - 2. If a non-resident contractor is the successful bidder on this project, he shall be required to post surety bond, or deposit cash or securities with the South Carolina Tax Commission in compliance with the Act. Proof of such coverage shall be filed with the Engineer before work is started.
 - 3. If the Contractor fails to comply with the regulations of the South Carolina Tax Commission, two percent (2%) of each and every payment made to the Contractor shall be retained by the Owner to satisfy such requirements.
- H. The Owner shall provide and maintain competent and adequate observation of construction as required by 40 CFR 35.2214.

END OF SECTION 01060

SECTION 01061 – PERMITS AND RIGHTS-OF-WAY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DESCRIPTION

- A. Work included: This section establishes requirements pertaining to the securement and payment for licenses, building permits, rights-of-way, etc. necessary for the construction of the project.
- B. Work not included: The Owner will obtain and provide to the Contractor, as required, copies of:

Encroachment permits, State Highway Department
Encroachment permits, Public Utility.
Easements obtained to cross private property.
S.C. Department of Health and Environmental Control Permit to Construct.

1.3 SUBMITTALS

- A. Submit to Architect satisfactory evidence that all necessary licenses, building permits, etc. have been secured prior to commencing the work.

PART 2 – PRODUCTS (Not required)

PART 3 – EXECUTION

3.1 BUSINESS LICENSE

- A. Determine licenses required to perform the work at project location.
- B. Obtain all necessary licenses at no additional cost to the Owner.

3.2 BUILDING PERMITS

- A. Building permit is required for this project and will be issued by the Horry County Building Department.
- B. All other required permits shall be paid for and obtained by the Contractor.

3.3 RIGHTS-OF-WAYS, UTILITY LINES

- A. Owner will provide necessary right-of-way or easements for construction of utility lines, whether on privately or publicly owned property.

3.4 NPDES PERMIT FOR CONSTRUCTION ACTIVITY

- A. The Contractor is responsible for filing a "Notice of Intent" with the South Carolina Department of Health and Environmental Control (SCDHEC) for a National Pollutant Discharge Elimination system (NPDES) Permit under 40 CFR Part 122.
- B. Permit application must be filed thirty (30) days prior to commencing construction activity.
- C. The Contractor shall use Best Management Practices (BMP) to control sediment runoff from construction areas.

3.5 LAND

- A. The necessary land for construction of the project will be provided by the Owner.

END OF SECTION 01061

SECTION 01100 – ALTERNATES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

- A. To allow the Owner to compare total costs where alternate materials and methods might be used, and to enable the Owner's decision prior to awarding the contract, certain alternates have been established as described in this section of these specifications.
- B. The Contractor shall state in their bid the amount to be added to or deducted from their bid if the below stated alternates are accepted.

1.3 SUBMITTALS

- A. All alternates described in this section of the specifications are required to be reflected in the bid submitted on the Bid Form for this work. However, do not submit alternates other than those described in this section except as may be provided for by addenda.

1.4 PRODUCT HANDLING

- A. If the Owner elects to proceed on one or more of the alternates, make all modifications to the work required in the furnishing and installation of the selected alternate or alternates to the approval of the Architect and at no additional cost to the Owner except as proposed on the Bid Form.

PART 2 – ALTERNATE DESCRIPTIONS

2.1 CONTRACT ALTERNATES:

A. ADD ALTERNATE NO. 1 (TRUCK BAY #4)

- 1. Contractor shall state price difference, which would represent all labor and materials required to add a fourth Interior Truck Bay as indicated in the Contract Documents. If this Alternate is accepted, it will include all work required in the areas of Architectural, Civil, Structural, Plumbing, Mechanical and Electrical as indicated.

B. ADD ALTERNATE NO. 2 (STATIONARY DIESEL EMERGENCY POWER GENERATOR)

- 1. Contractor shall state price difference which would represent all labor and materials required to provide and install a Stationary Diesel Emergency Power Generator with permanent connections to building systems as indicated on the PME drawings and specifications. If Alternate is not accepted, Contractor shall provide a transfer switch for portable generator.

C. ADD ALTERNATE NO. 3 (POURED EPOXY FLOOR FINISH)

- 1. Contractor shall state price difference, which would represent labor and materials to provide a Poured Epoxy Floor Finish in Space 118 Bunk Room and in Space 119 Alcove in lieu of Laminated Vinyl Plank (LVP) as indicated on the Room Finish Schedule Sheet A4.0. If this

Alternate is accepted, it will include all work required as indicated on these Construction Documents.

END OF SECTION 01100

SECTION 01140 – CONTRACTOR'S USE OF THE PREMISES

PART 1 - GENERAL

1.1 USE OF PREMISES

- A. Retain paragraph and subparagraphs below if site will be accessible to other parties or if parts of a building being renovated will be occupied during construction. Revise to suit Project. See Evaluations for discussion about model text and limits on use of site.
- B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.
 - 1. Owner Occupancy: Allow for Owner occupancy of site and use by the public.
 - 2. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Firearms are not allowed on the site.

1.2 OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner will occupy site and existing building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations.
- B. Partial Owner Occupancy: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
 - 1. Subparagraphs below describe procedures and requirements necessary before partial occupancy of portions of Project.
 - 2. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
 - 3. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
 - 4. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will provide, operate, and maintain mechanical and electrical systems serving occupied portions of building.
 - 5. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

END OF SECTION 01140

SECTION 01200 – PROJECT MEETINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:
 - 1. Preconstruction Conferences.
 - 2. Pre-Installation Conferences.
 - 3. Progress Meetings.
 - 4. Coordination Meetings.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01040 "Coordination" for procedures for coordinating project meetings with other construction activities.
 - 2. Division 1 Section 01300 "Submittals" for submitting the Contractor's Construction Schedule.

1.3 PRECONSTRUCTION CONFERENCE

- A. Schedule a preconstruction conference before starting construction, at a time convenient to the Owner and the Architect, but no later than 15 days after execution of the Agreement. Hold the conference at the Project Site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: Authorized representatives of the Owner, Architect, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
- C. Agenda: Discuss items of significance that could affect progress, including the following:
 - 1. Tentative construction schedule.
 - 2. Critical work sequencing.
 - 3. Designation of responsible personnel.
 - 4. Procedures for processing field decisions and Change Orders.
 - 5. Procedures for processing Applications for Payment.
 - 6. Distribution of Contract Documents.
 - 7. Submittal of Shop Drawings, Product Data, and Samples.
 - 8. Preparation of record documents.
 - 9. Use of the premises.
 - 10. Parking availability.
 - 11. Office, work, and storage areas.
 - 12. Equipment deliveries and priorities.
 - 13. Safety procedures.
 - 14. First aid.
 - 15. Security.

16. Housekeeping.
17. Working hours.

1.4 PREINSTALLATION CONFERENCES

- A. Required for all major portions of the construction trades (i.e. sitework and grading, site utility tie-ins to public systems, soil treatment, above slab utility rough-ins, building specialties, electrical, etc.). Contractor is advised pre-installation conferences shall not be scheduled until approved shop drawings of materials and accessories for scheduled portions of work to discuss have been received by the General Contractor and delivered to the project site.
- B. Conduct a pre-installation conference at the Project Site before each construction activity that requires coordination with other construction. Examples of activities to combine into separate conferences as follows:
 1. Initial Sitework: Clearing and Grading, storm and erosion control measures, building pad preparation, site utilities,
 2. Underslab utility rough-ins and slab preparations: Electrical and soil treatment
 3. Building Structures: CMU and brick masonry and accessories, building framing systems and water/moisture proofing.
 4. Above slab utilities: Electrical.
 5. Building final finishes and fixtures: Above ceiling inspections, ceiling finishes, exterior wall finishes, and final inspections and punch lists.
 6. Other preinstall conferences as outlined in the specifications.
- C. Attendees: The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. General contractor's project manager and site superintendent shall also attend along with representatives of the Owner and the Architect. If deemed necessary attendance by the design engineers shall also be included. The Subcontractor's Superintendent(s) associated with the activities included in the Pre-Installation Conference will be responsible for conducting the conference in order to demonstrate to the Architect, Engineer(s), and the Owner that ALL parties have a complete and thorough understanding of the associated Contract Requirements.
 1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related Change Orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Shop Drawings, Product Data, and quality-control samples.
 - g. Possible conflicts.
 - h. Compatibility problems.
 - i. Time schedules.
 - j. Weather limitations.
 - k. Manufacturer's recommendations.
 - l. Warranty requirements.
 - m. Compatibility of materials.
 - n. Acceptability of substrates.
 - o. Temporary facilities.
 - p. Space and access limitations.
 - q. Governing regulations.

- r. Safety.
 - s. Inspecting and testing requirements.
 - t. Required performance results.
 - u. Recording requirements.
 - v. Protection.
2. Record significant discussions and agreements and disagreements of each conference, and the approved schedule. Promptly distribute the record of the meeting to everyone concerned, including the Owner and the Architect.
 3. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 PROGRESS MEETINGS

- A. Conduct progress meetings at the Project Site at regular intervals. Notify the Owner and the Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.
- B. Attendees: In addition to representatives of the Owner and the Architect, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.
 1. Contractor's Construction Schedule: Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time. A large print copy of the current construction schedule shall be displayed at the project site for review and reference by all meeting attendees.
 2. Review the present and future needs of each entity present, including the following:
 - a. Interface requirements.
 - b. Time.
 - c. Sequences.
 - d. Status of submittals.
 - e. Deliveries.
 - f. Off-site fabrication problems.
 - g. Access.
 - h. Site utilization.
 - i. Temporary facilities and services.
 - j. Hours of work.
 - k. Hazards and risks.
 - l. Housekeeping.
 - m. Quality and work standards.
 - n. Change Orders.
 - o. Requests for Information and proposals
 - p. Documentation of information for payment requests.

- D. Reporting: Contractor shall record Minutes of Meeting. No later than 3 days after each meeting, distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

- 1. Schedule Updating: Revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

1.6 COORDINATION MEETINGS

- A. Conduct project coordination meetings at regular intervals convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.
- B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.
- C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01200

SECTION 01270 – UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.
- B. Related Sections include the following:
 - 1. Division 1 Section 01035 "Modification Procedures" for procedures for submitting and handling Change Orders.
 - 2. Division 1 Section 01401 "Quality Control & Special Inspections" for general testing and inspecting requirements.

1.2 DEFINITIONS

- A. Definition below expands the definition contained in AIA Document A701 and assumes a project where the Contract Documents indicate or provide estimated quantities and where bidders state on the Bid Form unit-price amounts they propose. Revise if bidders are required to estimate quantities as well and include them with the bid. Revise if the Contract is negotiated rather than bid.
- B. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A list of unit prices is included at the end of this Section. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

- A. Unit Prices are indicated on the Section 00040 "Form of Proposal."

END OF SECTION 01270

SECTION 01300 – SUBMITTALS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:

1. Contractor's construction schedule.
2. Submittal schedule.
3. Daily construction reports.
4. Shop Drawings.
5. Product Data.
6. Samples.
7. Quality assurance submittals.
8. Site Work Sequencing Plan
9. Asbestos application process

- B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Permits.
2. Applications for Payment.
3. Performance and payment bonds.
4. Insurance certificates.
5. List of subcontractors.

- C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Applications for Payment" specifies requirements for submittal of the Schedule of Values.
2. Division 1 Section "Coordination" specifies requirements governing preparation and submittal of required Coordination Drawings.
3. Division 1 Section "Project Meetings" specifies requirements for submittal and distribution of meeting and conference minutes.
4. Division 1 Section "Quality Control and Special Inspections" specifies requirements for submittal of inspection and test reports.
5. Division 1 Section "Contract Closeout" specifies requirements for submittal of Project Record Documents and warranties at project closeout.

1.3 DEFINITIONS

- A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.

1. Preparation of Coordination Drawings is specified in Division 1 Section "Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.

- B. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.

1.4 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
 - 3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.
 - a. Allow 2 weeks for initial review. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals.
 - b. If an intermediate submittal is necessary, process the same as the initial submittal.
 - c. Allow 2 weeks for reprocessing each submittal.
 - d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.
- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
 - 1. Provide a space approximately 4 by 5 inches (100 by 125 mm) on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
 - 2. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of the Architect.
 - d. Name and address of the Contractor.
 - e. Name and address of the subcontractor.
 - f. Name and address of the supplier.
 - g. Name of the manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
- C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect using a transmittal form. The Architect will not accept submittals received from sources other than the Contractor.
 - 1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart-type, contractor's construction schedule. Submit within 30 days after the date established for "Commencement of the Work."
1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values."
 2. Within each time bar, indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
 3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
 4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.
 5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other schedules.
- B. Work Stages: Indicate important stages of construction for each major portion of the Work, including shop drawings and submittal reviews, preinstallation conferences, testing and inspections, and installation, etc.
- C. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- D. Schedule Updating: Revise the schedule after each meeting, event, or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.6 SUBMITTAL SCHEDULE

- A. After development and acceptance of the Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the submittal schedule to the Architect for Architect and Engineer review within 10 days of award of the project. Submit the schedule no later than with the first (1st) pay request. Pay request will not be processed without receipt of submittal schedule.
1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Contractor's Construction Schedule.
 2. Prepare the schedule in chronological order. Provide the following information:
 - a. Scheduled date for the first submittal.
 - b. Related Section number.
 - c. Submittal category (Shop Drawings, Product Data, or Samples).
 - d. Name of the subcontractor.
 - e. Description of the part of the Work covered.
 - f. Scheduled date for resubmittal.
 - g. Scheduled date for the Architect's final release or approval.

- B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.
 - 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. Schedule Updating: Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.7 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report recording the following information concerning events at the site, and submit duplicate copies to the Architect at weekly intervals:
 - 1. List of subcontractors at the site.
 - 2. Approximate count of personnel at the site.
 - 3. High and low temperatures, general weather conditions.
 - 4. Accidents and unusual events.
 - 5. Meetings and significant decisions.
 - 6. Stoppages, delays, shortages, and losses.
 - 7. Meter readings and similar recordings.
 - 8. Emergency procedures.
 - 9. Orders and requests of governing authorities.
 - 10. Change Orders received, implemented.
 - 11. Services connected, disconnected.
 - 12. Equipment or system tests and startups.
 - 13. Partial Completions, occupancies.
 - 14. Substantial Completions authorized.

1.8 SHOP DRAWINGS

- A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.
- B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:
 - 1. Dimensions.
 - 2. Identification of products and materials included by sheet and detail number.
 - 3. Compliance with specified standards.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement.
 - 6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 36 by 48 inches (890 by 1220 mm).
 - 7. Submittal: If paper submittals are required, submit 6 blue- or black-line prints and 2 additional prints where required for maintenance manuals. The Architect will retain 2 prints and return the remainder.
 - a. One of the prints returned shall be marked up and maintained as a "Record Document."

8. Do not use Shop Drawings without an appropriate final stamp indicating action taken.

1.9 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.
 1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
 2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
 3. Submittals: If paper submittals are required, submit 6 copies of each required submittal. The Architect will retain one and will return the other marked with action taken and corrections or modifications required.
 - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
 4. Distribution: Furnish copies (paper or electronic) of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
 - a. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
 - b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.10 SAMPLES

- A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
 1. Mount or display Samples in the manner to facilitate review of qualities indicated. Prepare Samples to match the Architect's sample. Include the following:
 - a. Specification Section number and reference.
 - b. Generic description of the Sample.
 - c. Sample source.
 - d. Product name or name of the manufacturer.
 - e. Compliance with recognized standards.
 - f. Availability and delivery time.

2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least 3 multiple units that show approximate limits of the variations.
 - b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
 - c. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.
3. Preliminary Submittals: Submit a full set of choices where Samples are submitted for selection of color, pattern, texture, or similar characteristics from a range of standard choices.
 - a. The Architect will review and return preliminary submittals with the Architect's notation, indicating selection and other action.
4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit 1 set.
5. Maintain sets of Samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.
 - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
 - b. Sample sets may be used to obtain final acceptance of the construction associated with each set.
- B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.
 1. Field samples are full-size examples erected on-site to illustrate finishes, coatings, or finish materials and to establish the Project standard.
 - a. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.11 QUALITY ASSURANCE SUBMITTALS

- A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.
- B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
 1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.

- C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 1 Section "Quality Control and Special Inspections."

1.12 ARCHITECT'S ACTION

- A. Except for submittals for the record or information, where action and return is required, the Architect will review each submittal, mark to indicate action taken, and return promptly.
 - 1. Compliance with specified characteristics is the Contractor's responsibility.
- B. Action Stamp: The Architect will stamp each submittal with a uniform, action stamp. The Architect will mark the stamp appropriately to indicate the action taken, as follows:
 - 1. Final Unrestricted Release: When the Architect marks a submittal "Reviewed," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
 - 2. Final-But-Restricted Release: When the Architect marks a submittal "Approved as Noted," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
 - 3. Returned for Resubmittal: When the Architect marks a submittal "Not Approved, Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.
 - a. Do not use, or allow others to use, submittals marked "Not Approved, Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.
- C. Unsolicited Submittals: The Architect will return unsolicited submittals to the sender without action.
- D. Review of submittal and subsequent marking of a submittal as "Reviewed", "Furnish as Corrected" or "Revise and Resubmit" by the Architect or consulting engineers does not relieve the contractor of responsibility or liability for the product, material or system not complying with the contract documents.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01300

SECTION 01311 – SCHEDULES AND REPORTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for schedules and reports required for proper performance of the Work, including:
 - 1. Contractor's construction schedule.
 - 2. Submittal schedule.
 - 3. Daily construction reports.
 - 4. Field correction reports.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01027 "Applications for Payment" specifies requirements for submittal of the Schedule of Values.
 - 2. Division 1 Section 01200 "Project Meetings" specifies requirements for submittal and distribution of meeting and conference minutes.
 - 3. Division 1 Section 01401 "Quality Control & Special Inspections" specifies requirements for submittal of inspection and test reports.
 - 4. Division 1 Section 01600 "Materials and Equipment" specifies requirements for submittal of the list of products.

1.3 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of schedules and reports with performance of other construction activities.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Prepare a comprehensive, fully developed, horizontal bar-chart-type, contractor's construction schedule.
 - 1. Submit the schedule within 30 days of the date established for commencement of the Work.
 - 2. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week.
 - a. If practical, use the same breakdown of units of the Work as indicated in the Schedule of Values.
 - 3. Within each time bar, indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion percentage.
 - 4. For significant construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within the time bar. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion percentage.

5. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
 6. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on schedule with other construction activities. Include minor elements involved in the overall sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.
 7. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other required schedules and reports.
 8. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's administrative procedures necessary for certification of Substantial Completion.
- B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. Schedule Updating: Revise the schedule after each meeting, event, or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.5 SUBMITTAL SCHEDULE

- A. After development and acceptance of the Contractor's Construction Schedule, prepare a complete schedule of submittals cross referenced and coordinated with dates of the work indicated on the construction schedule as required to start and complete the work indicated. Submit the schedule within 10 days of the date required for submittal of the Contractor's Construction Schedule.
1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values and the list of products as well as the Contractor's Construction Schedule.
- B. Prepare the schedule in chronological order. Provide the following information:
1. Scheduled date for the first submittal.
 2. Related Section number.
 3. Submittal category.
 4. Name of the subcontractor.
 5. Description of the part of the Work covered.
 6. Scheduled date for resubmittal.
 7. Scheduled date for the Architect's final release or approval.
- C. Distribution: Following the Architect's response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with submittal dates indicated.
1. Post copies in the Project meeting room and temporary field office.
 2. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned part of the Work and are no longer involved in construction activities.

- D. Schedule Updating: Revise the schedule after each meeting or other activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.6 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at the site. Retain report at site through Substantial Completion:
 - 1. List of subcontractors at the site.
 - 2. List of separate contractors at the site.
 - 3. Approximate count of personnel at the site.
 - 4. High and low temperatures, general weather conditions.
 - 5. Accidents.
 - 6. Meetings and significant decisions.
 - 7. Unusual events (refer to special reports).
 - 8. Stoppages, delays, shortages, and losses.
 - 9. Meter readings and similar recordings.
 - 10. Emergency procedures.
 - 11. Orders and requests of governing authorities.
 - 12. Change Orders received, implemented.
 - 13. Services connected, disconnected.
 - 14. Equipment or system tests and startups.
 - 15. Partial Completions, occupancies.
 - 16. Substantial Completions authorized.
- B. Field Correction Reports: When the need to take corrective action that requires a departure from the Contract Documents arises, prepare a detailed report. Include a statement describing the problem and recommended changes. Indicate reasons the Contract Documents cannot be followed. Submit a copy to the Architect immediately.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01311

SECTION 01340 – SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submittal of Shop Drawings, Product Data, Samples, and other miscellaneous quality-control submittals.

- B. Shop Drawings include, but are not limited to, the following:

1. Fabrication drawings.
2. Installation drawings.
3. Setting diagrams.
4. Shopwork manufacturing instructions.
5. Templates and patterns.
6. Schedules.

- a. Standard information prepared without specific reference to the Project is not Shop Drawings.

- C. Product Data include, but are not limited to, the following:

1. Manufacturer's product specifications.
2. Manufacturer's installation instructions.
3. Standard color charts.
4. Catalog cuts.
5. Roughing-in diagrams and templates.
6. Standard wiring diagrams.
7. Printed performance curves.
8. Operational range diagrams.
9. Mill reports.
10. Standard product operating and maintenance manuals.
11. Sample warranties

- D. Samples include, but are not limited to, the following:

1. Partial Sections of manufactured or fabricated components.
2. Small cuts or containers of materials.
3. Complete units of repetitively used materials.
4. Swatches showing color, texture, and pattern.
5. Color range sets.
6. Components used for independent inspection and testing.
7. Field samples.

- E. Quality-control submittals include, but are not limited to, the following:

1. Design data.
2. Certifications.

3. Manufacturer's instructions.
 4. Manufacturer's field reports.
- F. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
1. Permits.
 2. Applications for payment.
 3. Performance and payment bonds.
 4. Insurance certificates.
 5. Listing of subcontractors.
- G. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 1 Section "Coordination" specifies requirements governing preparation and submittal of required Coordination Drawings.
 2. Division 1 Section "Schedules and Reports" specifies requirements for submittal of required schedules and reports, including the Submittal Schedule.
 3. Division 1 Section "Quality Control and Special Inspections" specifies requirements for submittal of inspection and test reports and the erection of mockups.
 4. Division 1 Section "Contract Closeout" specifies requirements for submittal of Project Record Documents, including copies of final Shop Drawings, at project closeout.

1.3 DEFINITIONS

- A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.
1. Preparation of Coordination Drawings is specified in Division 1 Section "Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.
- B. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.

1.4 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal to the Architect sufficiently in advance of scheduled performance of related construction activities to avoid delay.
1. Coordinate each submittal with other submittals and related activities that require sequential activity including:
 - a. Testing.
 - b. Purchasing.
 - c. Fabrication.
 - d. Delivery.
 2. Coordinate transmittal of different types of submittals for the same element of the Work and different elements of related parts of the Work to avoid delay in processing because of the Architect's need to review submittals concurrently for coordination.

- a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are forthcoming.
3. Scheduling: Division 1 Section "Schedules and Reports" includes the Submittal Schedule listing submittals and indicating time requirements for coordination of submittal activity with related construction operations.
4. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.
 - a. Allow 2 weeks for the Architect's initial review of each submittal. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals. The Architect will advise the Contractor when a submittal being processed must be delayed for coordination.
 - b. Where necessary to provide an intermediate submittal, process the intermediate submittal in the same manner as the initial submittal.
 - c. Allow 2 weeks for reprocessing each submittal.
 - d. The Architect will not authorize an extension of time because of the Contractor's failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.
- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification.
 1. Indicate name of the firm or entity that prepared each submittal on the label or title block.
 2. Provide a space approximately 4 by 5 inches (100 by 125 mm) on the label or beside the title block to record the Contractor's review and approval markings and the action taken by the Architect.
 3. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of the Architect.
 - d. Name and address of the Contractor.
 - e. Name and address of the subcontractor.
 - f. Name and address of the supplier.
 - g. Name of the manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
 - j. Similar definitive information as necessary.
- C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect and to other destinations by use of a transmittal form. The Architect will return submittals received from sources other than the Contractor.
 1. Record relevant information and requests for data on the transmittal form. On the form, or an attached separate sheet, record deviations from requirements of the Contract Documents, including minor variations and limitations.
 2. Include the Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 3. Transmittal Form: Prepare a draft of a transmittal form and submit it to the Architect for acceptance. Provide places on the form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).

- d. Source (From:).
- e. Names of the subcontractor, manufacturer, and supplier.
- f. Category and type of submittal.
- g. Submittal purpose and description.
- h. Submittal and transmittal distribution record.
- i. Remarks.
- j. Signature of transmitter.

1.5 SHOP DRAWINGS

- A. Submit newly prepared information, drawn accurately to scale. Do not reproduce Contract Documents or copy standard printed information as the basis of Shop Drawings.
 - 1. Include the following information on Shop Drawings:
 - a. Dimensions.
 - b. Identification of products and materials included.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - 2. Submit Coordination Drawings where required for integration of different construction elements. Show construction sequences and relationships of separate components where necessary to avoid conflicts in utilization of the space available.
 - 3. Highlight, encircle, or otherwise indicate deviations from the Contract Documents on the Shop Drawings.
 - 4. Do not allow Shop Drawing copies that do not contain an appropriate final stamp or other marking indicating the action taken by the Architect to be used in construction.
 - 5. Submit Shop Drawings electronically.
 - 6. Submittal: Submit in electronic format, unless prints are required for maintenance manuals.
 - a. The Contractor shall mark up and retain one of the prints returned as a "Record Document."

1.6 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Mark each copy to show which choices and options are applicable to the Project.
 - 1. Where Product Data includes information on several similar products, some of which are not required for use on the Project, mark copies clearly to indicate which products are applicable.
 - 2. Where Product Data must be specially prepared for required products, materials, or systems because standard printed data are not suitable for use, submit as Shop Drawings not Product Data.
 - 3. Include the following information in Product Data:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with recognized trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
 - 4. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

- B. Submittals: Submit 1 copy of each required Product Data submittal electronically. The Architect will retain one copy and will return the other marked with the action taken and corrections or modifications required.
 - 1. Unless the Architect observes noncompliance with provisions of the Contract Documents, the submittal may serve as the final submittal.
- C. Distribution: Furnish copies of final Product Data submittal to the manufacturers, subcontractors, suppliers, fabricators, installers, governing authorities and others as required for performance of the construction activities. Show distribution on transmittal forms.
 - 1. Do not proceed with installation of materials, products, and systems until a copy of Product Data applicable to the installation is in the Installer's possession.
 - 2. Do not permit use of unmarked copies of Product Data in connection with construction.

1.7 SAMPLES

- A. Submit full-size, fully fabricated Samples, cured and finished in the manner specified, and physically identical with the material or product proposed for use.
 - 1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Architect's sample where so indicated. Include the following information:
 - a. Generic description of the Sample.
 - b. Size limitations.
 - c. Sample source.
 - d. Product name or name of manufacturer.
 - e. Compliance with recognized standards.
 - f. Compliance with governing regulations.
 - g. Availability.
 - h. Delivery time.
 - 2. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented by a Sample, submit at least 3 multiple units that show approximate limits of the variations.
 - b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
 - c. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.
- B. Submittals: Except for Samples intended to illustrate assembly details, workmanship, fabrication techniques, connections, operation, and other characteristics, submit 3 sets of Samples. One set will be returned marked with the action taken.
 - 1. Maintain sets of Samples, as returned by the Architect, at the Project Site, available for quality-control comparisons throughout the course of construction activity.
 - 2. Unless the Architect observes noncompliance with provisions of the Contract Documents, the submittal may serve as the final submittal.

3. Sample sets may be used to obtain final acceptance of the construction associated with each set.
- C. Distribution of Samples: Distribute additional sets of Samples to the subcontractors, suppliers, fabricators, manufacturers, installers, governing authorities, and others as required for performance of the Work. Show distribution on transmittal forms.
- D. Field samples specified in individual Specification Sections are special types of Samples. Comply with Sample submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.8 QUALITY ASSURANCE SUBMITTALS

- A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.
- B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
 1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.
- C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 1 Section "Quality Control and Special Inspections."

1.9 CONTRACTOR'S ACTION

- A. The General Contractor is required to provide qualified personnel who must review, comment, mark corrections, etc., of all shop drawings, manufacturer's data, samples, etc., prior to submission to the Architect for review.
- B. It is the General Contractor's responsibility to review and confirm all submittals and the products, materials, equipment, etc., contained therein are in conformance with the Contract Documents.
- C. Any and all nonconforming submittals shall be rejected by the General Contractor and returned to the parties submitting review documentation.
- D. Neither the Architect or Owner will be held liable for delays due to nonconforming submittals by the General Contractor or any of their subcontractors, suppliers, vendors, etc.

1.10 ARCHITECT'S ACTION

- A. Except for submittals for the record or for information, where action and return of submittals is required, the Architect will review each submittal, mark to indicate the action taken, and return.
 1. Compliance with specified characteristics is the Contractor's responsibility and not considered part of the Architect's review and indication of action taken.
- B. Action Stamp: The Architect will stamp each submittal with a uniform, action stamp. The Architect will mark the stamp appropriately to indicate the action taken, as follows:

1. Final Unrestricted Release: Where submittals are marked "Approved," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final acceptance will depend on that compliance.
2. Final-but-Restricted Release: When submittals are marked "Approved as Noted," the Work covered by the submittal may proceed provided it complies with both the Architect's notations or corrections on the submittal and requirements of the Contract Documents. Final acceptance will depend on that compliance.
3. Returned for Resubmittal: When submittal is marked "Not Approved, Revise and Resubmit," do not proceed with the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the Architect's notations. Resubmit without delay. Repeat if necessary to obtain a different action mark.
 - a. Do not permit submittals marked "Not Approved, Revise and Resubmit" to be used at the Project Site or elsewhere where construction is in progress.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01340

SECTION 01401 – QUALITY CONTROL AND SPECIAL INSPECTIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality-control services and special inspections.
- B. Quality-control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
- D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
 - 1. Specific quality-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 inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- E. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 3 Concrete.

1.3 RESPONSIBILITIES

- A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services are included in the Contract Sum.
 - 1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Contract Sum.
 - 2. Contractor's responsibilities include providing of certifications and tests of fabricators required by Article 1704.2, Chapter 17 of the International Building Code.
 - 3. Contractor's responsibilities relative to the "Special Inspector" are indicated further in this Section.

- B. Owners Responsibilities: Where indicated, the Owner shall provide inspections, test and other quality-control services specified herein and required by authorities having jurisdiction. Cost of the services will be paid by the Owner.
1. Owner will provide inspection and testing services, performed by a "Special Inspector", as indicated in "SPECIAL INSPECTION REQUIREMENTS" Table included at the end of this Section and on drawings.
 2. Special Inspector will perform inspections in accordance with Tables 1704.3 and 1704.4 and other relevant articles of Chapter 17 of the IBC.
 - a. A pre-construction meeting shall be held for the purpose of reviewing the special inspection requirements of the project. Required attendees include the Owner, Architect, General Contractor and the Special Inspector.
 - b. A Special Inspections Project Manual will be developed by the Special Inspector and be distributed to all parties in attendance at the pre-construction meeting. The Special Inspection Project Manual will identify the specific special inspection requirements of the project.
 3. General Contractor's responsibilities relative to the Special Inspector include the following:
 - a. The General Contractor shall ensure that copies of approved plans, specifications and shop drawings are provided to the Special Inspector prior to the start of the affected work.
 - b. The Contractor is responsible for notifying the Special Inspector when the work is ready for inspection. A minimum of 24-hours notice shall be provided so the Special Inspector has time to inspect the work prior to concealment. The Contractor shall provide access to and means for safe and proper inspection of the work.
 - c. The General Contractor shall create a file (three-ring binder) for the Special Inspector's daily reports. This file shall be located in a conspicuous place in the project trailer/office to allow review by the Building Department Inspectors. No Certificate of Occupancy will be issued until the Special Inspector's completion report has been reviewed and approved the Building Department.
 - d. When the work requiring special inspections is completed and all nonconforming items have been resolved, the General Contractor shall notify the Special Inspector to submit a Completion Report (included at the end of this Section) to the Building Department, AOR/EOR, and General Contractor. A Certificate of Occupancy will not be issued until the final report has been reviewed and approved by the Building Department.
 4. Special Inspector's responsibilities include the following:
 - a. It is the Special Inspector's responsibility to thoroughly review the approved plans in advance of construction to establish that adequate information is available to conduct the required inspections and tests. All errors and/or omissions in the reviewed plans that create any form of uncertainty or ambiguity shall be resolved through the AOR or EOR.
 - b. An approved Special Inspector shall perform inspections and/or tests of the work for conformance with the approved plans, specifications, shop drawings and applicable provisions of the International Building Code. It is the Special Inspector's responsibility to verify that all work requiring special inspections is inspected and/or tested prior to concealment.
 - c. After each inspection, the Special Inspector shall complete a Special Inspection Daily Report (included at the end of this Section) and give it to the Contractor. Any nonconforming items shall be brought to the immediate attention of the General Contractor and noted on the Daily Report form.
 - d. The Special Inspector of record shall submit a Special Inspection Weekly Report (included at the end of this Section) to the Building Department and AOR/EOR weekly until all work requiring special inspections is complete. Weekly report shall include the following:

- 1) A brief summary of the work performed during the reporting time frame.
 - 2) Changes and/or discrepancies with the approved drawings or specifications that were observed during the reporting period.
 - 3) Discrepancies that were resolved or corrected.
 - 4) A list of nonconforming items requiring resolution.
 - 5) All applicable test results.
- C. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.
1. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.
- D. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
1. Provide access to the Work.
 2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
 3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
 4. Provide facilities for storage and curing of test samples.
 5. Deliver samples to testing laboratories.
 6. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
 7. Provide security and protection of samples and test equipment at the Project Site.
- E. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
1. The agency shall notify the Architect and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
 3. The agency shall not perform any duties of the Contractor.
- F. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.4 SUBMITTALS

- A. Unless the Contractor is responsible for this service, the independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect. If

the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs – see Chapter 17 and other components of IBC.
2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making the inspection or test.
 - f. Designation of the Work and test method.
 - g. Identification of product and Specification Section.
 - h. Complete inspection or test data.
 - i. Test results and an interpretation of test results.
 - j. Ambient conditions at the time of sample taking and testing.
 - k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
 - l. Name and signature of laboratory inspector.
 - m. Recommendations on retesting.

1.5 QUALITY ASSURANCE

- A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are pre-qualified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.
 1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching".
- B. Protect construction exposed by or for quality control service activities, and protect repaired construction.
- C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 01401

See following pages for:

- Special Inspection Requirements
- Special Inspection Daily Report
- Special Inspection Weekly Report

Special Inspection Completion Report
Statement of Special Inspections (4 pages)
Masonry Inspection Frequency Chart
Steel Composite Frequency Inspection Chart

SPECIAL INSPECTION REQUIREMENTS

Project: A NEW BUILDING REPLACEMENT FOR: FINKLEA FIRE STATION #6

Address: _____ PMH Project # 24002

INSPECTION ITEMS	FREQUENCY		NAME OF SPECIAL INSPECTOR	SPECIAL INSPECTOR CERTIFICATION NO.	AGENCY
	C	P			
REINFORCED CONCRETE (RC)		X			INSPECTION AGENCY TO BE APPROVED BY SPECIAL INSPECTOR AND BUILDING OFFICIAL PER IBC 2018
PRETENSION TENDONS (PC1)	N/A				
POST-TENSION TENDONS (PC2)	N/A				
POST-TENSION SLABS-ON-GROUND (PTS)	N/A				
WELDING (SW)	N/A				
NONDESTRUCTIVE TESTING MT, PT, US or RT (SN/)	N/A				
HIGH-STRENGTH BOLTING (SS)		X			INSPECTION AGENCY TO BE APPROVED BY SPECIAL INSPECTOR AND BUILDING OFFICIAL PER IBC 2018
WOOD FRAMES (SS)	N/A				
STRUCTURAL MASONRY (SM)		X			INSPECTION AGENCY TO BE APPROVED BY SPECIAL INSPECTOR AND BUILDING OFFICIAL PER IBC 2018
SPRAYED FIRE-RESISTANT MATERIAL (FP)	N/A				
PILING & DRILLED PIERS (PDP)	N/A				
VERIFICATION OF SOILS (VS)		X			INSPECTION AGENCY TO BE APPROVED BY SPECIAL INSPECTOR AND BUILDING OFFICIAL PER IBC 2015
MODULAR RETAINING WALLS (MRW)	N/A				
PRECAST CONCRETE ERECTION (PCE)	N/A				
EXTERIOR INSULATION & FINISH SYSTEM * (EIF)	N/A				
SMOKE CONTROL (SC)	N/A				
SEISMIC RESISTANCE (SR)		X			INSPECTION AGENCY TO BE APPROVED BY SPECIAL INSPECTOR AND BUILDING OFFICIAL PER IBC 2018
WIND QUALITY ASSURANCE		X			INSPECTION AGENCY TO BE APPROVED BY SPECIAL INSPECTOR AND BUILDING OFFICIAL PER IBC 2018
DETENTION BASIN (DB)	N/A				
SPECIAL CASES (XX)	N/A				

OTHER INSPECTIONS

INSPECTION ITEMS	FREQUENCY		NAME OF INSPECTOR		
	C	P			
CONCRETE TESTING		X			INSPECTION AGENCY TO BE APPROVED BY SPECIAL INSPECTOR AND BUILDING OFFICIAL PER IBC 2018
VERIFICATION OF SOILS		X			INSPECTION AGENCY TO BE APPROVED BY SPECIAL INSPECTOR AND BUILDING OFFICIAL PER IBC 2018

NA = Not Applicable
 C = Continuous
 P = Periodic
 * = Not required by IBC

AOR/EOR PIKE - McFARLAND - HALL ASSOCIATES, INC.

SIGNATURE _____ DATE _____



Project Name: _____ Date: _____

Project Address: _____ Control #: _____

Indicate the items inspected and/or tested:

REINFORCED CONCRETE

- ☐ Placement of Concrete
- ☐ Testing of Concrete
- ☐ Reinforcing Steel Placement
- ☐ Bolts Installed Concrete
- ☐ Pre-stress or ☐ Post-Tension Concrete

SOILS AND FOUNDATIONS

- ☐ Verification of Soils
- ☐ Excavation
- ☐ Structural Fill
- ☐ Drilled Piers, Piles
- ☐ Detention Basin
- ☐ Earth Retaining Structure

STRUCTURAL MASONRY

- ☐ Inspection of Rebar Placement/Grouting
- ☐ Mortar and Grout Testing ☐ Wall Prisms

STRUCTURAL STEEL

- ☐ High Strength Bolting
- ☐ Welding of Structural Steel
- ☐ Metal Deck Welding
- ☐ Shear Stud Welding
- ☐ Welding of Reinforcing Steel
- ☐ Steel Frame Inspection

SPRAYED FIRE RESISTANT MATERIALS

- ☐ Placement Inspection
- ☐ Density Test
- ☐ Thickness Tests

PRECAST CONCRETE

- ☐ Inspection of Erected Panels
- ☐ Welding of Panel Connections

INSPECTION OF FABRICATORS

- ☐ Metal Building ☐ Structural Steel
- ☐ Precast Concrete

SPECIAL: ☐ Smoke Control ☐ EIFS ☐ Seismic Resistance ☐ Other

OTHER: _____

List locations of inspection/test made: _____

Were there any discrepancies with the reviewed plans? ☐ Yes ☐ No
Were there any changes to the reviewed plans? ☐ Yes ☐ No
Were any previously listed items corrected or resolved? ☐ Yes ☐ No

If yes, describe _____

Special Inspections Agency: _____

Inspector: _____ Signature: _____
(Print)

Certification No. _____

Time Beginning Inspection _____ Time Ending Inspection: _____

Project Address: _____ Control #: _____

Project Name: _____

Company Name: _____

This report covers work done between _____ and _____

This is to certify that I inspected and/or tested the following items in accordance with Section 1704 of the 2006 International Building Code: (Check appropriate items).

- ☐ None – Work Has Not Started.
- ☐ Placement of Reinforced Concrete
- ☐ Testing of Reinforced Concrete
- ☐ Placement of Reinforcing Steel
- ☐ Placement of Pre-stressing Steel
- ☐ Post-Tension Concrete
- ☐ bolts Installed Concrete
- ☐ Verification of Soils
- ☐ Excavation and Filling
- ☐ Drilled Piers and/or Piles
- ☐ Earth-Retaining Structure
- ☐ ELFS
- ☐ Smoke Control

Other: _____

Except where noted in the attached report, the work was found to be in substantial compliance with the approved plans, specifications and applicable provisions of the special inspection plan.

Signed: _____ Date: _____

Submit To:

cc: Engineer or Architect of Record and the General Contractor

Project Name: _____ Date: _____

Project Address: _____ Control #: _____

Indicate the items inspected and/or tested:

REINFORCED CONCRETE

- ☐ Placement of Concrete
- ☐ Testing of Concrete
- ☐ Reinforcing Steel Placement
- ☐ Bolts Installed in Concrete
- ☐ Pre-stress or ☐ Post-Tension Concrete

SOILS AND FOUNDATIONS

- ☐ Verification of Soils
- ☐ Excavation
- ☐ Structural Fill
- ☐ Drilled Piers, Piles
- ☐ Detention Basin
- ☐ Earth Retaining Structure

STRUCTURAL MASONRY

- ☐ Inspection of Rebar Placement/Grouting
- ☐ Mortar and Grout Testing ☐ Wall Prisms

STRUCTURAL STEEL

- ☐ High Strength Bolting
- ☐ Welding of Structural Steel
- ☐ Metal Deck Welding
- ☐ Shear Stud Welding
- ☐ Welding of Reinforcing Steel
- ☐ Steel Frame Inspection

SPRAYED FIRE RESISTANT MATERIALS

- ☐ Placement Inspection
- ☐ Density Test
- ☐ Thickness Tests

PRECAST CONCRETE

- ☐ Inspection of Erected Panels
- ☐ Welding of Panel Connections

INSPECTION OF FABRICATORS

- ☐ Metal Building ☐ Structural Steel
- ☐ Precast Concrete

SPECIAL: ☐ Smoke Control ☐ EIFS ☐ Seismic Resistance ☐ Other

OTHER: _____

The work identified above is complete and to the best of my knowledge was found to be in substantial compliance with the approved plans, specifications and applicable provisions of the special inspection plan.

Special Inspections Agency: _____

Inspector: _____ Signature: _____
(Print)

Certification No. _____

ITEMS INDICATED UNDERLINED ARE TO BE TESTED AND/OR INSPECTED.

STATEMENT OF SPECIAL INSPECTIONS

BUILDING COMPONENTS OR MATERIAL	MATERIAL SUBMITTAL	TESTING REQUIREMENTS	TESTING FREQUENCY	TESTING AGENCY	INSPECTION / MONITORING	INSPECTION FREQUENCY	INSPECTION AGENCY	PART OF WIND QUALITY ASSURANCE	PART OF SEISMIC QUALITY ASSURANCE
SOILS (COMPACTED FILL)	N/A	1. Test in place dry density of compacted fill	1. As approved Geotechnical Engineer	Testing lab to be approved by Special Inspection Coordinator and Building Official	As excavation and fill placement begins, the following shall be verified to ensure compliance with Geotechnical Report: 1. Materials below shallow foundations are adequate to achieve the design bearing capacity as specified in soils report. 2. Excavations are extended to proper depth and have reached proper material. 3. Perform classification and testing of compacted fill materials. 4. Use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill. 5. Prior to placement of compacted fill, observe subgrade and verify that site has been properly prepared.	1. Periodic 2. Periodic 3. Periodic 4. Continuous 5. Periodic	Inspection Agency to be approved by Special Inspection Coordinator and Building Official per IBC	Columns and shearwalls accordance with approved Soils Report prior to placement of fill	Columns and shearwalls accordance with approved Soils Report prior to placement of fill
CONCRETE FOUNDATIONS	1. Submit concrete mix design 2. Submit foundation reinforcement shop drawings 3. Verify proper concrete strength	1. Test concrete strength	1. One (1) set of cylinders for each vertical lift or each 50 yards of concrete.	Testing lab to be approved by Special Inspection Coordinator and Building Official	As concrete and reinforcing steel construction begins, the following shall be inspected to ensure compliance: 1. Verify reinforcing size, quantity and placement 2. Anchors cast in concrete. 3. Anchors post installed in hardened concrete. 4. Verifying use of required design mix. 5. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content test and determine the temperature of concrete. 6. Concrete placement for proper application techniques. 7. Inspect formwork for; shape location and dimensions of the concrete member being formed.	1. Periodic 2. Periodic 3. Periodic 4. Periodic 5. Continuous 6. Continuous 7. Periodic	Inspection Agency to be approved by Special Inspection Coordinator and Building Official	1. Spread footings at bearing walls and shearwall	1. Spread footings at bearing walls and shearwall
CONCRETE MASONRY UNITS	Submit Test Data on CMU Units; net area of compressive strength 1900 PSI or greater. Type 'S' mortar grout mix 2000 PSI	Test compressive strength of mortar	(1) Set of grout cubes from each floor	Testing lab to be approved by Special Inspection Coordinator and Building Official	See Masonry Inspection Chart	See Masonry Inspection Chart	Inspection Agency to be approved by Special Inspection Coordinator and Building Official	Yes	Yes

BUILDING COMPONENTS OR MATERIAL	MATERIAL SUBMITTAL	TESTING REQUIREMENTS	TESTING FREQUENCY	TESTING AGENCY	INSPECTION / MONITORING	INSPECTION FREQUENCY	INSPECTION AGENCY	PART OF WIND QUALITY ASSURANCE	PART OF SEISMIC QUALITY ASSURANCE
METAL BUILDING SYSTEM AND COMPONENTS	1. Submit manufacturer's certified mill test reports for structural steel.	N/A	N/A	N/A	1. Inspect steel frame joint details for compliance with construction documents	1. Periodic	Inspection Agency to be approved by Special Inspection Coordinator and Building Official per IBC	Floor and roof system framing	Floor and roof system framing
STRUCTURAL STEEL	1. Submit manufacturer's certified mill test reports for structural steel	N/A	N/A	N/A	1. Inspect steel frame joint details for compliance with construction documents	1. Periodic	Inspection Agency to be approved by Special Inspection Coordinator and Building Official per IBC	Floor and roof system framing	Floor and roof system framing
STRUCTURAL STEEL HIGH-STRENGTH BOLTING (AND MECHANICAL FASTENING OF METAL DECK)	1. Submit manufacturer's certificate of compliance for high-strength bolts, nuts, washers and/or fasteners	N/A	N/A	N/A	1. Verify bolting in bearing-type connections are installed in accordance with AISC specifications 2. Verify bolting in slip-critical connections are installed in accordance with AISC specifications 3. Verify identification markings on high-strength bolts, nuts & washers conforming to ASTM standards specified 4. Verify fastener type and adherence to specified fastener attachment pattern 5. Verify proper storage and handling of bolts, nuts and washers.	1. Periodic 2. Continuous (May be periodic if turn-of-nut with match- marking methods, direct tension indicator or alternate design fastener (twist-off) methods are used) 3. Periodic 4. Periodic 5. Periodic	Inspection Agency to be approved by Special Inspection Coordinator and Building Official per IBC	Floor and roof system bolting	Floor and roof system bolting
STRUCTURAL STEEL WELDING	1. Submit manufacturer's certificate of compliance for weld filler material	N/A	N/A	N/A	Verify welding is in compliance with AWS D1.1 1. Complete and partial penetration groove welds 2. Multipass fillet welds 3. Single-pass fillet welds >5/16" 4. Single-pass fillet welds < or = 5/16" 5. Floor and deck welds	1. Continuous 2. Continuous 3. Continuous 4. Periodic 5. Periodic	Inspection Agency to be approved by Special Inspection Coordinator and Building Official per IBC	Floor and roof system welding	Floor and roof system welding
COLD FORM FRAMING	1. Submit manufacturer's certified mill test reports for structural steel	N/A	N/A	N/A	1. Verify all sizes, spacings, and gauges etc. conform with construction documents 2. Verify all connections and fasteners conform with construction documents 3. Verify all bridging and bracing conforms with construction documents	1. Periodic 2. Periodic 3. Periodic	Inspection agency to be approved by special inspection coordinator & building official per IBC	Yes	Yes
ANCHORAGE OF ELECTRICAL EQUIPMENT USED FOR EMERGENCY OR STANDBY POWER	1. Submit anchor type and literature.	1. submit manufacturer's test reports	N/A	N/A	1. Verify fastener location and installation.	1. Periodic	Inspection Agency to be approved by Special Inspection Coordinator and Building Official per IBC	No	Yes

BUILDING COMPONENTS OR MATERIAL	MATERIAL SUBMITTAL	TESTING REQUIREMENTS	TESTING FREQUENCY	TESTING AGENCY	INSPECTION / MONITORING	INSPECTION FREQUENCY	INSPECTION AGENCY	PART OF WIND QUALITY ASSURANCE	PART OF SEISMIC QUALITY ASSURANCE
QUALITY ASSURANCE FOR SEISMIC RESISTANCE	SEE SEISMIC QUALITY ASSURANCE PLAN								
QUALITY ASSURANCE FOR WIND REQUIREMENTS	SEE WIND QUALITY ASSURANCE PLAN								

Note: All testing, inspection and related reports shall be sent to the Special Inspection coordinator and the Owner.
Any deficiencies shall be clearly noted and brought to the attention of the special Inspection Coordinator before the end of the Inspector's shift.

SEISMIC ASSURANCE PLAN

1. The following seismic systems and seismic-force-resisting systems are subject to quality assurance:
 - A. Masonry shearwall reinforcement
 - B. Attachment of roof structural system to shearwalls
 - C. Installation of suspended ceiling and their anchorage
 - D. Anchorage of electrical equipment used for emergency or stand-by power
 - E. Anchorage of exterior wall panels and/or glazing
1. Provide special inspections for systems indicated above as indicated in Special Inspections chart.
3. Type and frequency of testing per chart.
4. Type and frequency of special inspections see chart.
5. All reports to Architect, Structural Engineer and Special Inspections Coordinator.
6. Periodic structural observation will be performed at significant construction stages and at the completion of the structural system
7. Structural observation reports to Architect, Structural Engineer.

CONTRACTOR'S RESPONSIBILITY

Each Contractor responsible for the construction of a seismic-force-resisting system, designated seismic system, or a component listed in the seismic quality assurance plan shall submit a written contractor's statement of responsibility to the Building Official and to the Owner prior to the commencement of work on the system or component. The Contractor's statement of responsibility shall contain the following:

1. Acknowledgement of awareness of the special requirements contained in the wind quality assurance plan.
2. Acknowledgement that control will be exercised to obtain conformance with the construction documents approved by the Building Official.
3. Procedures for exercising control within the Contractor's organization, the method and frequency of reporting and the distribution of the reports.
4. Identifications and qualifications of person(s) exercising such control and their position(s) in the organization.

WIND QUALITY ASSURANCE PLAN

1. The following main wind force-resisting systems and wind resisting components are subject to quality assurance:
 - A. Masonry shearwall construction and reinforcement
 - B. Roof diaphragm systems
 - C. Wall connections to roof diaphragm and framing
 - D. Glazing system fabrication and installation
 - E. Roof cladding and roof framing components
2. Provide special inspections for systems indicated above as indicated in Special Inspections chart.
3. Type and frequency of testing per chart.
4. Type and frequency of special inspections see chart.
5. All reports to Architect, Structural Engineer and Special Inspections Coordinator.
6. Periodic structural observation will be performed at significant construction stages and at the completion of the structural system.
7. Structural observation reports to Architect, Structural Engineer.

CONTRACTOR'S RESPONSIBILITY

Each Contractor responsible for the construction of a main windforce-resisting system or a wind-resisting component listed in the wind quality assurance plan shall submit a written statement of responsibility to the Building Official and the Owner prior to the commencement of work on the system or component. The Contractor's statement of responsibility shall contain the following:

1. Acknowledgement of awareness of the special requirements contained in the wind quality assurance plan.
2. Acknowledgement that control will be exercised to obtain conformance with the construction documents approved by the Building Official.
3. Procedures for exercising control within the Contractor's organization, the method and frequency of reporting and the distribution of the reports.
4. Identifications and qualifications of person(s) exercising such control and their position(s) in the organization.

MASONRY INSPECTION FREQUENCY CHART		
	FREQUENCY OF INSPECTION	
INSPECTION TASK	CONTINUOUS DURING TASK LISTED	PERIODICALLY DURING TASK LISTED
As masonry construction begins, the following shall be verified to ensure compliance:		
1. Proportions of site-prepared mortar	-	X
2. Construction of mortar joints	-	X
3. Location of reinforcement connectors	-	X
This inspection program shall verify:		
1. Size & location of structural elements	-	X
2. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction	-	X
3. Specified size, grade and type of reinforcement	-	X
4. Protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F)	-	X
Prior to grouting, the following shall be verified to ensure compliance:		
1. Grout space is clean	-	X
2. Placement of reinforcement and connectors	-	X
3. Proportions of site prepared grout	-	X
4. Construction of mortar joints	-	X
Grout placement shall be verified to ensure compliance with code and construction document provisions:	X	-
Preparation of any required grout specimens, mortar, specimens and/or prisms shall be observed	X	-
Compliance with required inspections provisions of the construction documents and the approved submittals shall be verified	-	X

STEEL COMPOSITE INSPECTION FREQUENCY CHART		
	INSPECTION TASK	
INSPECTION TASK	QUALITY CONTROL	QUALITY ASSURANCE
<u>PRIOR</u> to the placement of concrete for composite system following shall be verified to ensure compliance:		
1. Placement and installation of steel deck	P	P
2. Placement and installation of steel headed stud anchors	P	P
3. Document acceptance or rejection of steel elements	P	P

SECTION 01421 – REFERENCE STANDARDS AND DEFINITIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Basic contract definitions are included in the Conditions of the Contract.
- B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. Location is not limited.
- C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases.
- D. "Approved": The term "approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.
- E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": The term "install" describes operations at the Project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.
- I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 - 1. The term "experienced", when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
 - 2. Trades: 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 tradespersons of the corresponding generic name.

3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.

- a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.
- J. "Project Site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.
- K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Format: These Specifications are organized into Divisions and Sections based on the 16-division format and CSI/CSC's "MasterFormat" numbering system.
- B. Specification Content: These Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Section Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of the date of the Contract Documents.
- C. Conflicting Requirements: Where 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 the Architect for a decision before proceeding.

1. 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 the requirements. Refer uncertainties to the Architect for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-producing organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books "National Trade & Professional Associations of the U.S.", which are available in most libraries.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01421

SECTION 01500 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection.
- B. Note: Contractor's set-up of the job site construction trailer on the project site along with temporary power and operational telephone/fax service and equipment shall be required prior to the first "pre-installation" conference. Request for extension of time due to the contract's inability to setup temporary facilities as previously stated will not be granted unless otherwise approved by the Owner and Architect.
- C. Temporary utilities include, but are not limited to, the following:
 - 1. Water service and distribution.
 - 2. Temporary electric power and light.
 - 3. Temporary heat.
 - 4. Ventilation.
 - 5. Telephone/facsimile service.
 - 6. Sanitary facilities, including drinking water.
 - 7. Storm and sanitary sewer.
- D. Support facilities include, but are not limited to, the following:
 - 1. Field offices and storage sheds.
 - 2. Temporary roads and paving.
 - 3. Dewatering facilities and drains.
 - 4. Temporary enclosures.
 - 5. Hoists and temporary elevator use.
 - 6. Temporary project identification signs and bulletin boards.
 - 7. Waste disposal services.
 - 8. Rodent and pest control.
 - 9. Construction aids and miscellaneous services and facilities.
- E. Security and protection facilities include, but are not limited to, the following:
 - 1. Temporary fire protection where required by code.
 - 2. Barricades, warning signs, and lights.
 - 3. Sidewalk bridge or enclosure fence for the site when required.
 - 4. Environmental protection.

1.3 SUBMITTALS

- A. Temporary Utilities: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

1.4 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
 - 1. Building code requirements.
 - 2. Health and safety regulations.
 - 3. Utility company regulations.
 - 4. Police, fire department, and rescue squad rules.
 - 5. Environmental protection regulations.
- B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities".
 - 1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code".
- C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- A. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.
- B. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.
- C. Water: Provide potable water approved by local health authorities.
- D. Open-Mesh Fencing: Provide 0.120-inch- (3-mm-) thick, galvanized 2-inch (50-mm) chainlink fabric fencing 6 feet (2 m) high galvanized steel pipe posts, 1-1/2 inches (38 mm) I.D. for line posts and 2-1/2 inches (64 mm) I.D. for corner posts.

2.2 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide barricades and walkways required by governing authorities for public right-of-ways.

- C. Provide suitable barriers and such warning lights as will effectively prevent the occurrence of any accident to health, limb, or property.
- D. Lights shall be maintained between the hours of sunset and sunrise.
- E. Provide protection for plant life designated to remain. Replace damaged plant life.
- F. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

2.3 WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

2.4 PROTECTION OF INSTALLED WORK

- A. Protect installed work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

2.5 EQUIPMENT

- A. General: Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
- B. Water Hoses: Provide 3/4-inch (19-mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet (30 m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
- D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
- E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.
- F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.
- G. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.

- H. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- I. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.
 - 1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
 - 2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
 - 3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
 - 4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect. Neither the Owner nor Architect will accept cost or use charges as a basis of claims for Change Orders.
- B. Water Service: The existing water service is to remain and the General Contractor shall have the water meter bill and service transferred into his name for the duration of the project. Upon substantial completion, the General Contractor and the Owner shall coordinate to have the water meter bill and service transferred back into the Owner's name.
 - 1. Sterilization: Sterilize temporary water piping prior to use.
- C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.
 - 1. Install electric power service underground, except where overhead service must be used.

2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, ac 20 Ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
- D. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching.
1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
- E. Temporary Heat: Provide temporary heat required by construction activities for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
- F. Temporary Telephones: Provide temporary telephone service throughout the construction period for all personnel engaged in construction activities. Install telephone on a separate line for each temporary office and first-aid station.
1. Separate Telephone Lines: Provide additional telephone lines for the following:
 - a. Where an office has more than 2 occupants, install a telephone for each additional occupant or pair of occupants.
 2. At each telephone, post a list of important telephone numbers.
- G. Sanitary facilities include temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material.
- H. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.
- I. Drinking-Water Facilities: Provide containerized, tap-dispenser, bottled-water drinking-water units, including paper supply.

3.3 SUPPORT FACILITIES INSTALLATION

- A. Locate field offices, storage sheds, and other temporary construction and support facilities for easy access.
1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
- B. Provide incombustible construction for offices, shops, and sheds located within the construction area or within 30 feet (9 m) of building lines. Comply with requirements of NFPA 241.

- C. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project Site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices as follows:
 - 1. Furnish with a desk and chairs, a 4-drawer file cabinet, plan table, plan rack, and a 6-shelf bookcase.
- D. Storage and Fabrication Sheds: Install storage and fabrication sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on-site.
- E. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations, and construction free of water.
- F. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
 - 1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 - 2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 sq. ft. (2.3 sq. m) or less with plywood or similar materials.
 - 3. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
- G. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.
 - 1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated.
 - 2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.
- H. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations".
 - 1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.

2. Store combustible materials in containers in fire-safe locations.
 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
 4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- B. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
- C. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- D. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.
1. Provide open-mesh, chainlink fencing with posts set in a compacted mixture of gravel and earth.
- E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- F. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
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. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent

construction that may have been delayed because of interference with the 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 the Contractor's property. The Owner reserves the right to take possession of project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
 - a. Replace air filters and clean inside of ductwork and housings.
 - b. Replace significantly worn parts and parts subject to unusual operating conditions.
 - c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 01500

SECTION 01568 – EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Installation of silt barriers such as silt fence or straw bales.
- B. Installation of rock check dams.
- C. Seeding for the purpose of slope stabilization or erosion control.
- D. Installation of rip-rap for slope stabilization.
- E. Removal of erosion control devices.

1.3 RELATED WORK

- A. Section 02200 "Backfilling"
- B. Section 02300 "Trenching"

1.4 REFERENCED STANDARDS

- A. South Carolina State Highway Department (SCSHD): Standard Specification for Highway Construction, 1986 Edition
- B. South Carolina Code of Regulations, Chapter 72, Article 2 (Erosion & Sediment Reduction & Stormwater Management Regulations)
- C. Guide to Site Development and Best Management Practices for Storm Water Management and Sediment Control (SCLRCC).

1.5 SUBMITTALS

- A. Proposed materials to be employed, for siltation control and preventing erosion damage shall be submitted for approval. Submittals shall include:
 - 1. List of proposed materials including manufacturer's product data.

1.6 EROSION CONTROL PRINCIPLES

- A. The following erosion control principles shall apply to the land grading and construction phases:
 - 1. Stripping of vegetation, grading, or other soil disturbance shall be done in a manner which will minimize soil erosion.
 - 2. Whenever feasible, natural vegetation shall be retained and protected.
 - 3. Extent of area which is exposed and free of vegetation shall be kept within practical limits.
 - 4. Temporary seeding, mulching, or other suitable stabilization measures shall be used to protect exposed critical areas during prolonged construction or other land disturbance.

5. Drainage provisions shall accommodate increased runoff resulting from modifications of soil and surface conditions during and after development or disturbance. Such provisions shall be in addition to existing requirements.
 6. Sediment shall be retained on-site.
 7. Erosion control devices shall be installed as early as possible in the construction sequence prior to start of clearing and grubbing operations and excavation work.
- A. Cut and fill slopes and stockpiled materials shall be protected to prevent erosion. Slopes shall be protected with permanent erosion protection when erosion exposure period is expected to be greater than or equal to two (2) weeks, and temporary erosion protection when erosion exposure period is expected to be less than two (2) weeks.
1. Permanent erosion protection shall be accomplished by seeding with grass and covering with an erosion protection material, as appropriate for prevailing conditions.
 2. Temporary erosion protection shall be accomplished by covering with erosion protection materials, as appropriate for prevailing conditions.
 3. Except where specified slope is indicated on Drawings, fill slopes shall be limited to a grade of 2:1 (horizontal: vertical) cut slopes shall be limited to a grade of 1.5:1.

1.7 SECTION DESCRIPTION

- A. Provide all equipment and materials, and do all work necessary to construct a complete erosion and sediment control program for minimizing erosion and siltation during the construction phase of the project. The Contractor shall provide additional erosion and sediment control materials and methods as required to effect the erosion and siltation control principles specified herein.

PART 2 – PRODUCTS

2.1 SILT FENCE

- A. Silt fence shall be a wire-bound woodroll snow fence covered with filter fabric. Fence shall be 4 ft. high minimum, and shall have 3/8 in. by 1-1/2 in. wide pickets, approximately 2 in. apart, bound together with at least 13 gage minimum, galvanized steel wire.
1. Filter fabric shall be one of the following, or approved equal:

<u>Product</u>	<u>Manufacturer</u>
MIRAFI Silt Fence	MIRAFI, Charlotte, NC 28224
 2. Silt fence shall be supported by wooded posts, driven a minimum of 3 ft. into the ground. Posts shall be spaced 10 ft. o.c. maximum.
 3. Fencing other than that specified above shall be subject to review and acceptance by the Engineer.

2.2 HAY BALES

- A. Hay bales for construction of erosion control devices shall be new, firm, wire- or nylon-bound livestock feed-grade.

2.3 TEMPORARY SEED COVER

- A. Grass seed for temporary seed cover shall be previous year's crop. Not more than 0.5% by weight shall be weed seed and not more than 1.75% by weight crop seed. Seed shall be delivered to site

in sealed containers, labeled with name of seed grower and seed formula, in form stated below. Seed shall be dry and free of mold. Seed shall meet the requirements of SCDOT Standard Specifications Sections 810.03 and 810.04 for temporary vegetation.

B. Seed for temporary seed cover shall conform to the following requirements:

1. All seed must meet the requirements of the state seed laws including the labeling requirements for showing pure live seed, (PLS - purity x germination), name and type of seed.
2. Seed furnished shall be of the previous season's crop and the date of analysis shown on each bag shall be within nine months of the time of use on the project. Each variety of seed shall be furnished and delivered in separate bags or containers.
3. A sample of each variety of seed shall be furnished for analysis and testing when directed by the Architect/Engineer. The amount and type of seed planted per acre shall be as specified below.
4. All seed shall be treated with fungicide approved by the Engineer.
5. Seed application rate shall conform to SCDOT Standard Specifications Section 810.04.

2.4 RIP-RAP

- A. Rip-rap shall consist of hard quarry of field stone and shall be of such quality that it will be resistant to exposure to the action of water and air.
- B. Stone shall consist of well graded mixture of 6" to 8" stone.

2.5 CHECK DAM

- A. Check dams may be placed in swale and ditch sections to reduce velocities and erosion. Check dams shall consist of 12 inch or hand placed sized rip rap. The Contractor shall place the stone at locations shown on the plans and in other areas as approved by the Engineer where erosion occurs. The check dams shall be cleaned and otherwise maintained by the Contractor on a regular basis.

PART 3 – EXECUTION

3.1 TEMPORARY SEED COVER

- A. Grass seed shall be spread by mechanical spreader at the specified rate.
- B. Following seeding, area shall be lightly raked to mingle seed with the top 1/8 to 1/4 in. of soil. Areas shall then be smoothed and rolled.
- C. Following rolling, entire area shall be watered until equivalent of a 2 in. depth of water has been applied to entire seeded surface, at a rate which will not dislodge seed. Watering shall be repeated thereafter as frequently as required to prevent drying of surface, until grass attains an average height of 1-1/2 in.
- D. At the Contractor's option, seed may be spread by the hydroseeding method, utilizing power equipment commonly used for that purpose. Seed and mulch shall be mixed and applied to achieve application quantities specified herein for the conventional seeding method, with mulch applied at the rate of 2700 lb. dry weight of mulch per acre. A mulching machine, acceptable to the Engineer, shall be equipped to eject the thoroughly wet mulch material at a uniform rate to provide the mulch coverage specified. Other provisions specified above for conventional seeding shall apply to hydroseeding.

1. If the results of hydroseeding application are unsatisfactory, the mixture and/or application rate and methods shall be modified to achieve the required results.
2. After the grass has appeared, all areas and parts of areas which fail to show a uniform stand of grass, for any reason whatsoever, shall be re-seeded and such areas and parts of areas seeded repeatedly until all areas are covered with a satisfactory growth of grass.

3.2 SILT FENCE

- A. Silt fence shall be constructed and installed as shown on the plans, prior to start of clearing and grubbing operations.

3.3 HAY BALE DIKE

- A. Bales shall be placed in a row with ends tightly abutting the adjacent bales. Each bale shall be embedded in the soil a minimum of 4 in. Bales shall be securely anchored in place by stakes or steel bars driven through the bales. The first stake in each bale shall be angled toward the previously laid bale to force the bales together.

3.4 HAY BALE CATCH BASIN FILTER

- A. Catch basin filters shall be placed at all inlets to drainage structures as structures are installed. Outlet protection work shall be constructed before runoff is allowed to enter the drainage system.

3.5 MAINTENANCE AND REMOVAL OF EROSION CONTROL DEVICES

- A. Wetland areas, water courses, and drainage swales adjacent to construction activities shall be monitored twice each month for evidence of silt intrusion and other adverse environmental impacts, which shall be corrected immediately upon discovery.
- B. Culverts and drainage ditches shall be kept clean and clear of obstructions during construction period.
- C. Erosion control devices
 1. Sediment behind the erosion control device shall be checked twice each month and after each heavy rain. Silt shall be removed if greater than 6 in. deep.
 2. Condition of erosion control device shall be checked twice each month or more frequently as required. Damaged and/or deteriorated items shall be replaced. Erosion control devices shall be maintained in place and in effective condition.
 3. Hay bales shall be inspected frequently and maintained or replaced as required to maintain both their effectiveness and essentially their original condition. Underside of bales shall be kept in close contact with the earth below at all times, as required to prevent water from washing beneath bales.
 4. Sediment deposits shall be disposed of off-site, in a location and manner which will not cause sediment nuisance elsewhere.
- D. Removal of Erosion Control Devices
 1. Erosion control devices shall be maintained until all disturbed earth has been paved or vegetated, at which time they shall be removed. After removal, areas disturbed by these devices shall be re-graded and seeded.
 2. Erosion protection material shall be kept securely anchored until acceptance of completed slope or entire Project, whichever is later.

3.6 PAYMENT

Payment for erosion control devices shall be on a unit price basis. Payment shall include the furnishing of all materials, labor and installation of all erosion control devices as shown on plans or specified in the Contract Documents.

END OF SECTION

SECTION 01600 – MATERIALS AND EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01421 "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
 - 2. Division 1 Section 01300 "Submittals" specifies requirements for submittal of the Contractor's Construction Schedule and the Submittal Schedule.
 - 3. Division 1 Section 01631 "Substitutions" specifies administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 DEFINITIONS

- A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.
 - 1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material", "equipment", "system", and terms of similar intent.
 - a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
 - 2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
 - 3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 SUBMITTALS

- A. Product List: Prepare a list showing products specified in tabular form acceptable to the Architect. Include generic names of products required. Include the manufacturer's name and proprietary product names for each item listed.
 - 1. Coordinate product list with the Contractor's Construction Schedule and the Schedule of Submittals.
 - 2. Form: Prepare product list with information on each item tabulated under the following column headings:
 - a. Related Specification Section number.

- b. Generic name used in 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.
- g. Projected delivery date or time span of delivery period.

1.5 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
 - 1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.
- B. Compatibility of Options: When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
- C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
 - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
 - 1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 – PRODUCTS

2.1 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.
 1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:
 1. Proprietary Specification Requirements: Where Specifications name only a single product or manufacturer, provide the product indicated. No substitutions will be permitted.
 2. Semiproprietary Specification Requirements: Where Specifications name 2 or more products or manufacturers, provide 1 of the products indicated. No substitutions will be permitted.
 - a. Where Specifications specify products or manufacturers by name, accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 3. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
 5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.
 - a. Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.
 6. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
 7. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

- a. Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category.
8. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selected.
9. Allowances: Refer to individual Specification Sections and "Allowances" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

PART 3 – EXECUTION

3.1 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
 1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

SECTION 01631 – SUBSTITUTIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract. Refer to Specification Section 01632 "Request For Pre-Approval" for pre-approval procedures prior to receipt of bids.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01421 "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
 - 2. Division 1 Section 01300 "Submittals" specifies requirements for submitting the Contractor's Construction Schedule and the Submittal Schedule.
 - 3. Division 1 Section 01600 "Materials and Equipment" specifies requirements governing the Contractor's selection of products and product options.

1.3 DEFINITIONS

- A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:
 - 1. Substitutions requested during the bidding period, and accepted by Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
 - 2. Revisions to the Contract Documents requested by the Owner or Architect.
 - 3. Specified options of products and construction methods included in the Contract Documents.
 - 4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

- A. Substitution request shall include the following information:
 - 1. Submit one copy of each request for substitution for consideration. Submit requests in the form and according to procedures required for change order proposals.
 - 2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.
 - 3. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

- a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors that will be necessary to accommodate the proposed substitution.
 - b. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.
 - c. Product data, including drawings and descriptions of products and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall contract time.
 - f. Cost information, including a proposal of the net change, if any in the contract sum.
 - g. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.
 - h. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
4. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation of a request for substitution. The Architect will notify the parties requesting substitution of acceptance or rejection of the substitution after receipt of the request, or after receipt of requested additional information or documentation, whichever is later. Architect will not be responsible for rejection of a substitution request due to negligence of the parties requesting substitution to submit all data required to determine equivalent evaluation of a substitution. Acceptance will be in the form of a change order.
- a. Use the product specified if the Architect cannot make a decision on the use of a proposed substitute request.

PART 2 – PRODUCTS

2.1 SUBSTITUTIONS

- A. Conditions: The Architect will receive and consider the Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by the Architect. If the following conditions are not satisfied, the Architect will return the requests without action except to record noncompliance with these requirements.
1. Extensive revisions to the Contract Documents are not required.
 2. Proposed changes are in keeping with the general intent of the Contract Documents.
 3. The request is timely, fully documented, and properly submitted.
 4. The specified product or method of construction cannot be provided within the contract time. The Architect will not consider the request if the product or method cannot be provided as a result of failure to pursue the work promptly or coordinate activities properly.
 5. The request is directly related to an "or equivalent" clause or similar language in the Contract Documents.
 6. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. The Owner's additional responsibilities may include compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner, and similar considerations.
 7. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.

8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.
 9. The specified product or method of construction cannot be coordinated with other materials and where the Contractor certifies that the proposed substitution can be coordinated.
 10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.
- B. The Contractor's submittal and the Architect's acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.
- C. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. The Architect will notify the Contractor of acceptance or rejection of the substitution within two weeks of receipt of the request, or one week of receipt of additional information or documentation, whichever is later. Acceptance will be in the form of a change order.
1. Use the product specified if the Architect cannot make a decision on the use of a proposed substitute within the time allocated.
- D. CSI Form 13.1A (latest edition) MUST be included with submission.

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01631

SECTION 01632 – REQUEST FOR PRE-APPROVAL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for handling pre-approval requests for substitutions prior to receipt of bids. Refer to Specification Section 01631 "Substitutions" for substitution request procedures after award of contract.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 0 Section 01050 "Field Engineering" specifies the Instructions to Bidders (AIA Document A701) for Substitutions
 - 2. Division 1 Section 01421 "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
 - 3. Division 1 Section 01300 "Submittals" specifies requirements for submitting the Contractor's Construction Schedule and the Submittal Schedule.
 - 4. Division 1 Section 01600 "Materials and Equipment" specifies requirements governing the Contractor's selection of products and product options.
- C. No substitute to that specified or called for on the drawings will be considered unless request for approval is submitted NOT LESS THAN TEN (10) CALENDAR DAYS PRIOR TO THE BID DATE and approval of same issued to all Bidders of Record by Addendum not later than five (5) calendar days prior to the bid date. Each request shall contain the following:
 - 1. Name of project and location.
 - 2. Name of material or equipment to be submitted.
 - 3. Performance and test data.
 - 4. Any and all other detailed specification information required for an evaluation.
 - 5. Specified location of item in contract documents.
 - 6. Complete list designating any changes in related materials, equipment, and/or work that inclusion of substitute would necessitate.
 - 7. Difference between specified item and item submitted for approval.
 - 8. Line item by line item comparison of differences between specified item and item submitted for approval.
 - 9. Samples, when applicable.
- D. NOTE: The burden of proof of the merit of the proposed substitution is upon the parties requesting approval.
- E. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

1.3 SUBMITTALS

- A. Substitution request prior to receipt of bids submittal: The Architect will consider requests for substitution if received at least ten (10) days prior to bid date. Requests received less than ten (10) days prior to bid date will not be considered.
 - 1. Submit one copy of each request for substitution for consideration.

2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.
3. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors that will be necessary to accommodate the proposed substitution.
 - b. A detailed comparison (item-for-item), of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effects.
 - c. Product data, including drawings and descriptions of products and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall contract time.
 - f. Cost information, including a proposal of the net change, if any in the contract sum.
 - g. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.
 - h. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
4. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation of a request for substitution. The Architect will notify the parties requesting substitution of acceptance or rejection of the substitution after receipt of the request, or after receipt of requested additional information or documentation, whichever is later. Architect will not be responsible for rejection of a substitution request due to negligence of the parties requesting substitution to submit all data required to determine equivalent evaluation of a substitution. Acceptance will be included in an addendum prior to receipt of bid proposals.
 - a. Use the product specified if the Architect cannot make a decision on the use of a proposed substitute request prior to receipt of bids.

B. CSI Form 13.1A (latest edition) MUST be included with submission.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01632

SECTION 01710 – FINAL CLEANING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for final cleaning at Substantial Completion.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01500 "Construction Facilities and Temporary Controls" specifies general cleanup and waste-removal requirements.
 - 2. Division 1 Section 01750 "Contract Closeout" specifies general contract closeout requirements.
 - 3. Special cleaning requirements for specific construction elements are included in appropriate Sections of Divisions 2 through 16.
- C. Environmental Requirements: Conduct cleaning and waste-disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and antipollution regulations.
 - 1. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains.
 - 2. Burning or burying of debris, rubbish, or other waste material on the premises is not permitted.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 – EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final-cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
- B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for the entire Project or a portion of the Project.
 - 1. Clean the Project Site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and foreign substances.

2. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 3. Remove petrochemical spills, stains, and other foreign deposits.
 4. Remove tools, construction equipment, machinery, and surplus material from the site.
 5. Remove snow and ice to provide safe access to the building.
 6. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 7. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 8. Remove labels that are not permanent labels.
 9. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 10. Wipe surfaces of electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 11. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs and defective and noisy starters in fluorescent and mercury vapor fixtures.
 12. Leave the Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests. Comply with regulations of local authorities.
- D. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.
- E. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of lawfully.
1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Owner.

END OF SECTION 01710

SECTION 01720 – PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents.
- B. Project Record Documents required include the following:
 - 1. Marked-up copies of Contract Drawings.
 - 2. Marked-up copies of Shop Drawings.
 - 3. Newly prepared drawings.
 - 4. Marked-up copies of Specifications, addenda, and Change Orders.
 - 5. Marked-up Product Data submittals.
 - 6. Record Samples.
 - 7. Field records for variable and concealed conditions.
 - 8. Record information on Work that is recorded only schematically.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Submittals" specifies general requirements for preparing and submitting Project Record Documents.
 - 2. Division 1 Section "Contract Closeout" specifies general closeout requirements.
 - 3. Divisions 2 through 13 Sections for specifying Project Record Document requirements for specific pieces of equipment or building operating systems.
- D. Maintenance of Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition. Make documents and Samples available at all times for the Architect's inspections.

1.3 RECORD DRAWINGS

- A. Markup Procedure: During construction, maintain a set of blue- or black-line white prints of Contract Drawings and Shop Drawings for Project Record Document purposes.
 - 1. Mark these Drawings to show the actual installation where the installation varies from the installation shown originally. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later. Items required to be marked include, but are not limited to, the following:
 - a. Dimensional changes to the Drawings.
 - b. Revisions to details shown on the Drawings.
 - c. Depths of foundations below the first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.

- g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by change order or Construction Change Directive.
 - k. Changes made following the Architect's written orders.
 - l. Details not on original Contract Drawings.
2. Mark record prints of Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings location.
 3. Mark record sets with red erasable colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 4. Mark important additional information that was either shown schematically or omitted from original Drawings.
 5. Note Construction Change Directive numbers, alternate numbers, change-order numbers, and similar identification.
- B. Responsibility for Markup: The individual or entity who obtained record data, whether the individual or entity is the Installer, subcontractor, or similar entity, shall prepare the markup on record drawings.
1. Accurately record information in an understandable drawing technique.
 2. Record data as soon as possible after obtaining it. Record and check the markup prior to enclosing concealed installations.
 3. At time of Substantial Completion, submit record drawings to the Architect for the Owner's records. Organize into sets and bind and label sets for the Owner's continued use.
- C. Newly Prepared Record Drawings: Prepare new drawings instead of following procedures specified for preparing record drawings where new drawings are required, and the Architect determines that neither original Contract Drawings nor Shop Drawings are suitable to show the actual installation. New drawings may be required when a change order is issued as a result of accepting an alternate, substitution, or other modification.
1. Consult with the Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. When completed and accepted, integrate newly prepared Drawings with procedures specified for organizing, copying, binding and submitting record drawings.

1.4 RECORD SPECIFICATIONS

- A. During the construction period, maintain 1 copy of the Project Specifications, including addenda and modifications issued, for Project Record Document purposes.
1. Mark the Specifications to indicate the actual installation where the installation varies from that indicated in Specifications and modifications issued. Note related project record drawing information, where applicable. Give particular attention to substitutions, selection of product options, and information on concealed installations that would be difficult to identify or measure and record later.
 2. Upon completion of markup, submit record Specifications to the Architect for the Owner's records.

1.5 RECORD PRODUCT DATA

- A. During the construction period, maintain one copy of each Product Data submittal for Project Record Document purposes.

1. Mark Product Data to indicate the actual product installation where the installation varies substantially from that indicated in Product Data submitted. Include significant changes in the product delivered to the site and changes in manufacturer's instructions and recommendations for installation.
2. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
3. Note related Change Orders and markup of record Drawings, where applicable.
4. Upon completion of markup, submit a complete set of record Product Data to the Architect for the Owner's records.
5. Where record Product Data is required as part of maintenance manuals, submit marked-up Product Data as an insert in the manual instead of submittal as record Product Data.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 RECORDING

- A. Post changes and modifications to the Documents as they occur. Do not wait until the end of the Project.

END OF SECTION 01720

SECTION 01730 – OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for operation and maintenance manuals, including the following:
 - 1. Preparing and submitting operation and maintenance manuals for building operating systems and equipment.
 - 2. Preparing and submitting instruction manuals covering the care, preservation, and maintenance of architectural products and finishes.
 - 3. Instruction of the Owner's operating personnel in the operation and maintenance of building systems and equipment.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Submittals" specifies preparation of Shop Drawings and Product Data.
 - 2. Division 1 Section "Contract Closeout" specifies general closeout requirements.
 - 3. Division 1 Section "Contract Closeout" specifies general requirements for submitting project record documents.
 - 4. Appropriate Sections of Divisions 2 through 13 specify special operation and maintenance data requirements for specific pieces of equipment or building operating systems.

1.3 QUALITY ASSURANCE

- A. Maintenance Manual Preparation: In preparation of maintenance manuals, use personnel thoroughly trained and experienced in operation and maintenance of equipment or system involved.
 - 1. Where maintenance manuals require written instructions, use personnel skilled in technical writing where necessary for communication of essential data.
 - 2. Where maintenance manuals require drawings or diagrams, use draftsmen capable of preparing drawings clearly in an understandable format.
- B. Instructions for the Owner's Personnel: Use experienced instructors thoroughly trained and experienced in operation and maintenance of equipment or system involved to instruct the Owner's operation and maintenance personnel.

1.4 SUBMITTALS

- A. Form of Submittal: Prepare operation and maintenance manuals in the form of an instructional manual for use by the Owner's operating personnel. Organize into one (1) suitable set of manageable size. Where possible, assemble instructions for similar equipment into a single binder.
 - 1. Binders: For each manual, provide heavy-duty, commercial-quality, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2-

by-11- inch (115-by-280-mm) paper. Provide a clear plastic sleeve on the spine to hold labels describing contents. Provide pockets in the covers to receive folded sheets.

- a. Where 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-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.
 - b. Identify each binder on front and spine, with the printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter covered. Indicate volume number for multiple volume sets of manuals.
2. Dividers: Provide heavy paper dividers with celluloid-covered tabs for each separate Section. Mark each tab to indicate contents. Provide a typed description of the product and major parts of equipment included in the Section on each divider.
3. Protective Plastic Jackets: Provide protective, transparent, plastic jackets designed to enclose diagnostic software for computerized electronic equipment.
4. Text Material: Where maintenance manuals require written material, use the manufacturer's standard printed material. If manufacturer's standard printed material is not available, provide specially prepared data, neatly typewritten, on 8-1/2-by-11-inch (115-by-280-mm), 20-lb/sq. ft. (75-g/sq. m) white bond paper.
5. Drawings: Where maintenance manuals require drawings or diagrams, provide reinforced, punched binder tabs on drawings and bind in with text.
 - a. Where oversize drawings are necessary, fold drawings to the same size as text pages and use as a foldout.
 - b. If drawings are too large to be used practically as a foldout, place the drawing, neatly folded, in front or rear pocket of binder. Insert a typewritten page indicating drawing title, description of contents, and drawing location at the appropriate location in the manual.

1.5 MANUAL CONTENT

- A. In each manual include information specified in the individual Specification Section and the following information for each major component of building equipment and its controls:
 1. General system or equipment description.
 2. Design factors and assumptions.
 3. Copies of applicable Shop Drawings and Product Data.
 4. System or equipment identification, including:
 - a. Name of manufacturer.
 - b. Model number.
 - c. Serial number of each component.
 5. Operating instructions.
 6. Emergency instructions.
 7. Wiring diagrams.
 8. Inspection and test procedures.
 9. Maintenance procedures and schedules.
 10. Precautions against improper use and maintenance.
 11. Copies of warranties.
 12. Repair instructions including spare parts listing.
 13. Sources of required maintenance materials and related services.
 14. Manual index.

- B. Organize each manual into separate Sections for each piece of related equipment. As a minimum, each manual shall contain a title page; a table of contents; copies of Product Data, supplemented by Drawings and written text; and copies of each warranty, bond, and service contract issued.
1. Title Page: Provide a title page in a transparent, plastic envelope as the first sheet of each manual. Provide the following information:
 - a. Subject matter covered by the manual.
 - b. Name and address of the Project.
 - c. Date of submittal.
 - d. Name, address, and telephone number of the Contractor.
 - e. Name and address of the Architect.
 - f. Cross-reference to related systems in other operation and maintenance manuals.
 2. Table of Contents: After title page, include a typewritten table of contents for each volume, arranged systematically according to the Project Manual format. Include a list of each product included, identified by product name or other appropriate identifying symbol and indexed to the content of the volume.
 - a. Where a system requires more than one volume to accommodate data, provide a comprehensive table of contents for all volumes in each volume of the set.
 3. General Information: Provide a general information Section immediately following 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 subcontractor or Installer and the maintenance contractor. Clearly delineate the extent of responsibility of each of these entities. Include a local source for replacement parts and equipment.
 4. Product Data: Where the manuals include manufacturer's standard printed data, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where the Project includes more than one item in a tabular format, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation, and delete references to information that is not applicable.
 5. Written Text: Prepare written text to provide necessary information where manufacturer's standard printed data is not available, and the information is necessary for proper operation and maintenance of equipment or systems. Prepare written text where it is necessary to provide additional information or to supplement data included in the manual. Organize text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operation or maintenance procedure.
 6. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems or to provide control or flow diagrams. Coordinate these drawings with information contained in project record drawings to assure correct illustration of the completed installation.
 - a. Do not use original project record documents as part of operation and maintenance manuals.
 7. Warranties, Bonds, and Service Contracts: Provide a copy of each warranty, bond, or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to follow in the event of product failure. List circumstances and conditions that would affect validity of warranty or bond.

1.6 MATERIAL AND FINISHES MAINTENANCE MANUAL

- A. Submit 1 copy of each manual, in final form, on material and finishes to the Architect for distribution. Provide one section for architectural products, including applied materials and finishes. Provide a second section for products designed for moisture protection and products exposed to the weather.
 - 1. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.
- B. Architectural Products: Provide manufacturer's data and instructions on care and maintenance of architectural products, including applied materials and finishes.
 - 1. Manufacturer's Data: Provide complete information on architectural products, including the following, as applicable:
 - a. Manufacturer's catalog number.
 - b. Size.
 - c. Material composition.
 - d. Color.
 - e. Texture.
 - f. Reordering information for specially manufactured products.
 - 2. Care and Maintenance Instructions: Provide information on care and maintenance, including manufacturer's recommendations for types of cleaning agents to be used and methods of cleaning. Provide information on cleaning agents and methods that could prove detrimental to the product. Include manufacturer's recommended schedule for cleaning and maintenance.
- C. Moisture Protection and Products Exposed to the Weather: Provide complete manufacturer's data with instructions on inspection, maintenance, and repair of products exposed to the weather or designed for moisture-protection purposes.
 - 1. Manufacturer's Data: Provide manufacturer's data giving detailed information, including the following, as applicable:
 - a. Applicable standards.
 - b. Chemical composition.
 - c. Installation details.
 - d. Inspection procedures.
 - e. Maintenance information.
 - f. Repair procedures.

1.7 EQUIPMENT AND SYSTEMS MAINTENANCE MANUAL

- A. Submit 1 copy of each manual, in final form, on equipment and systems to the Architect for distribution. Provide separate manuals for each unit of equipment, each operating system, and each electric and electronic system.
 - 1. Refer to individual Specification Sections for additional requirements on operation and maintenance of the various pieces of equipment and operating systems.
- B. Equipment and Systems: Provide the following information for each piece of equipment, each building operating system, and each electric or electronic system.

1. Description: Provide a complete description of each unit and related component parts, including the following:
 - a. Equipment or system function.
 - b. Operating characteristics.
 - c. Limiting conditions.
 - d. Performance curves.
 - e. Engineering data and tests.
 - f. Complete nomenclature and number of replacement parts.
2. Manufacturer's Information: For each manufacturer of a component part or piece of equipment, provide the following:
 - a. Printed operation and maintenance instructions.
 - b. Assembly drawings and diagrams required for maintenance.
 - c. List of items recommended to be stocked as spare parts.
3. Maintenance Procedures: Provide information detailing essential maintenance procedures, including the following:
 - a. Routine operations.
 - b. Troubleshooting guide.
 - c. Disassembly, repair, and reassembly.
 - d. Alignment, adjusting, and checking.
4. Operating Procedures: Provide information on equipment and system operating procedures, including the following:
 - a. Startup procedures.
 - b. Equipment or system break-in.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Instructions on stopping.
 - f. Shutdown and emergency instructions.
 - g. Summer and winter operating instructions.
 - h. Required sequences for electric or electronic systems.
 - i. Special operating instructions.
5. Servicing Schedule: Provide a schedule of routine servicing and lubrication requirements, including a list of required lubricants for equipment with moving parts.
6. Controls: Provide a description of the sequence of operation and as-installed control diagrams by the control manufacturer for systems requiring controls.
7. Coordination Drawings: Provide each Contractor's Coordination Drawings.
 - a. Provide as-installed, color-coded, piping diagrams, where required for identification.
8. Valve Tags: Provide charts of valve-tag numbers, with the location and function of each valve.
9. Circuit Directories: For electric and electronic systems, provide complete circuit directories of panelboards, including the following:
 - a. Electric service.
 - b. Controls.
 - c. Communication.

1.8 INSTRUCTIONS FOR THE OWNER'S PERSONNEL

- A. Prior to final inspection, instruct the Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Provide instruction at mutually agreed upon times.
 - 1. For equipment that requires seasonal operation, provide similar instruction during other seasons.
 - 2. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01730

SECTION 01740 – WARRANTIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01300 "Submittals" specifies procedures for submitting warranties.
 - 2. Division 1 Section 01750 "Contract Closeout" specifies contract closeout procedures.
 - 3. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.
 - 4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

- E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.4 SUBMITTALS

- A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
 - 1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.
- B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
- C. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
 - 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
 - 3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01740

SECTION 01750 – CONTRACT CLOSEOUT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Project record document submittal.
 - 3. Operation and maintenance manual submittal.
 - 4. Submittal of warranties.
 - 5. Final cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
 - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.
 - a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
 - b. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
 - 2. Advise the Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Submit record drawings (as-built), maintenance manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra stock, and similar items.
 - 7. Make final changeover of permanent locks and transmit keys directly to the Owner. (Recommended to request signed release form for all like items to be directly turned over to owner.) Advise the Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel.
 - 9. Complete final cleanup requirements, including touchup painting.
 - 10. Touch up and otherwise repair and restore marred, exposed finishes.
 - 11. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.

- B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Architect will repeat inspection when requested and assured that the Work is substantially complete.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.
4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the Owner took possession of and assumed responsibility for corresponding elements of the Work.
5. Submit a final liquidated damages settlement statement.
6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

- B. Reinspection Procedure: The Architect will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.

1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, reinspection will be repeated.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

END OF SECTION 01750

SECTION 02010 – SUB-SURFACE INVESTIGATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SOILS INVESTIGATION REPORT

- A. A report of GEOTECHNICAL EXPLORATION report dated May 9, 2024 has been prepared for the Finklea Fire Station site by the Soil Engineer named on this report
- B. The soils investigation report is included in the Project Manual for your use and information only and is not a specification.

1.3 USE OF DATA

- A. The attached report of Geotechnical Exploration was prepared by S&ME under direction by the Owner.
- B. The data indicated subsurface conditions are not intended as representations or warranties of the continuity of such conditions between soil borings. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn by the contractor. The data is made available for the convenience of the bidder.
- C. Bidders should visit the site and acquaint themselves with existing conditions.
- D. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but investigations may be performed only under time schedules and arrangements approved in advance by the Architect.

1.4 QUALITY ASSURANCE

- A. A Soil Engineer may be retained by the Owner to observe performance of work in connection with excavating, trenching, filling, backfilling, and grading, and to perform compaction tests.
- B. Readjust work performed that does not meet technical or design requirements but make no deviation from the Contractor Documents without specific and written approval from the Architect.

END OF SECTION 02010

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Report of Geotechnical Exploration
Finklea Fire Station No. 6
Green Sea, Horry County,
South Carolina
S&ME Project No. 23630075A

PREPARED FOR:

**Horry County Maintenance Department
307 Smith Street
Conway, South Carolina 29526**

PREPARED BY:

**S&ME, Inc.
1330 Highway 501 Business
Conway, SC 29526**

May 9, 2024



May 9, 2024

Horry County Maintenance Department
307 Smith Street
Conway, South Carolina 29526

Attention: John Barnhill; Director

Reference: **Report of Geotechnical Exploration
Finklea Fire Station No. 6**
Green Sea, Horry County, South Carolina
S&ME Project No. 23630075A

Dear Mr. Barnhill:

S&ME, Inc. has completed the subsurface exploration for the referenced project. Our exploration was conducted in general accordance with our Proposal No. 23630075A, dated April 5, 2024, authorized by you through the issuance of Horry County Purchase Order No. 24002081 dated April 11, 2024.

The purpose of this study was to characterize the surface and subsurface soils on the proposed site, and to provide recommendations for site preparation and earthwork, foundation types and seismic design values, on-site soil suitability, pavement subgrade preparation, and pavement section thickness recommendations. This report presents the findings of our exploration along with our conclusions and recommendations.

We previously issued a *Report of Preliminary Geotechnical Exploration* for this site under S&ME Project No. 23630075, report dated May 25, 2023. This report supersedes the information provided in the preliminary report. Where previously gathered data remains applicable, it has been included in this report.

S&ME, Inc. appreciates this opportunity to be of service to you. Please contact us if you have questions concerning this report or any of our services.

Sincerely,

S&ME, Inc.


Jeremy Lighthall, E.I.
Staff Professional




Ronald P. Forest, Jr., P.E.
Senior Engineer
Registration No. 21248

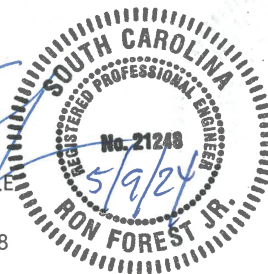




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◆ Report at a Glance

Key geotechnical findings based on our current understanding of the proposed project are presented below. These findings are presented as an overview and should not be used in place of the more detailed recommendations presented in the remainder of this report.

Category	Key Geotechnical Findings
Site Development Challenges	Site appears generally suitable for the proposed development, but site development will be challenging in several ways. Specific geotechnical issues identified on this site that should be considered include: - Control of surface water and shallow perched groundwater during wet periods of weather. - Stabilization of the soft native clayey surface soils after stripping, but prior to new fill placement. - Excessive settlement is anticipated due to the assumed 3-ft permanent fill embankment within the building pad footprint, requiring a 30-day waiting period after fill placement but prior to starting foundation construction to allow fill-induced settlements some time to dissipate. - Maintaining and achieving surface stability of fat clays in wet periods of weather may be difficult. A woven geotextile may be required for separation of fill soils and the native clayey subgrade. Operation of heavy rubber-tired equipment should be avoided on the native, near surface fat clay soils to minimize degradation of the surface.
Subsurface Conditions	- Cohesive soils (silts, clays, and clayey sands) to depths ranging from 25 to 28 feet. - Medium dense to very dense sands to the maximum exploration depth of 43.4 feet. - Groundwater at depths of 8 inches to 41 inches. - Site is highly susceptible to the development of a shallow perched water table.
Seismic Considerations	Liquefaction risk during seismic shaking is low. Risk Category IV. Site Class D. Seismic Design Category D. $S_{DS} = 0.281$, $S_{D1} = 0.163$, $PGA_M = 0.213g$.
Foundation Type	Shallow spread footings with a net allowable bearing pressure of up to 2,000 psf are acceptable with a total estimated post-construction static settlement of 1 inch and differential settlement of ½ inch under assumed maximum loads of 75-kip column, 5 kip/ft wall, and 250 psf area load (slab weight+ load on slab) after implementation of a 30-day waiting period after fill placement is complete but prior to foundation construction.
Slab Support	On-grade (soil supported). Modulus of subgrade reaction of 125 lbs./cu.in. is available.
Use of Site Soil as Fill	Soils of Stratum I are unsuitable to borrow or use as structural fill; therefore, all fill should be imported from offsite. Trench excavation soils will be unsuitable for re-use as backfill in the trenches.
Construction Dewatering	Site drainage should be implemented as soon as possible prior to construction. Construction dewatering using ditches and/or sumps with pumps may be required to control groundwater in excavations, and to control surface water infiltration.
Pavements	<i>Light Duty Asphalt (Employee Parking – Cars Only):</i> 2 in. of SCDOT Type C Surface HMA over 8 in. GABC over 24 in. sand fill subbase. <i>Heavy Duty Rigid (Fire Station Apron):</i> 8 in. of 4,000 psi continuously reinforced Concrete over 6 in. GABC over 6 in. granitic 57 stone over 18 in. sand fill subbase. Non-woven geotextile filter fabric (Mirafi 140N) between GABC and 57 layer and Woven geotextile (Mirafi HP-370) between subbase and No. 57 stone layer. See Figure 5 in Appendix I. <i>Subbase Fill Layer:</i> Imported sandy fill exhibiting a CBR of at least 10 percent when compacted to 98 percent of the modified Proctor maximum dry density. - A system of gravel-filled, fabric-wrapped underdrains should included in both the light duty and heavy duty pavement areas to help control potential shallow groundwater over the long term.



1.0 Introduction

The purpose of this exploration was to obtain subsurface information to allow us to characterize the subsurface conditions at the site and to develop recommendations concerning earthwork, foundations, pavements, and other related construction issues. This report describes our understanding of the project, presents the results of the field exploration and laboratory testing, and discusses our conclusions and recommendations.

A site plan showing the approximate exploration location is included in Appendix I. The sounding logs, hand auger logs, discussion of the field exploration procedures, and legends of soil classification and symbols are included in Appendix II. Appendix III contains the results of the laboratory testing and our laboratory test procedures. The appendices also include applicable information obtained in the previously performed exploration on this site, titled *Report of Preliminary Geotechnical Exploration – Finklea Tract*, dated May 25, 2023.

1.1 Site and Project Description

Project information was originally provided in an email from Mr. John Barnhill (Horry County Maintenance Dept.) to Ron Forest, Jr. (S&ME, Inc.) on April 1, 2024. The email contained a Site Plan, drawn by Pike McFarland Hall Associates, and dated March 2024.

1.1.1 Site Description

The existing site currently consists of an 3.4 acre fallow agricultural field located between SC Highway 9 and Fleetwood Road in Finklea, South Carolina. A Site Vicinity Map is attached in Appendix I as Figure 1.

1.1.2 Project Description

Based on the provided site layout plan, we understand that a new three-bay fire station with associated concrete driveways and fire truck aprons will be constructed. Asphalt employee parking and an approximate 0.19 acre pond are also planned. We anticipate that the structure will be supported on shallow foundations and may include cold-formed metal framing and/or structural masonry walls and a soil-supported slab on grade. We were not provided with any structural load information. We assume based on our previous experience with similar fire station projects that column and wall loads will not exceed 75 kips and 5 kips per foot, respectively, and that there will be a maximum uniform area load of 250 pounds per square foot, including the dead weight of the slab. Based on a conversation with Mr. Kyle Nobles (Diamond Shores), we have assumed that up to about 3 feet of fill may be needed within the building footprint to achieve the design grades.

2.0 Exploration Procedures

2.1 Field Exploration

On April 23, 2024 and April 28, 2024, representatives of S&ME, Inc. visited the site. Using the information provided, we performed the following tasks:



- We performed a site walkover, observing features of topography, existing structures, ground cover, and surface soils at the project site.
- We established two cone penetration test (CPT) sounding locations, labeled C-4 and C-5, within the approximate building footprint to supplement our three previously performed soundings, which were labeled C-1 through C-3.
- Soundings C-4 and C-5 were both advanced to a depth where no further advancement could be made under the maximum force of the rig, defined as "refusal", at depths ranging from 32.4 feet to 43.4 feet.
- We advanced a hand auger boring at each of the CPT sounding locations to observe the near surface soils (C-4 and C-5). These hand auger borings were advanced to a depth of 4 feet each.
- We advanced four additional hand auger borings (HA-4 through HA-7) with dynamic cone penetrometer (DCP) testing within the proposed parking and drive areas. These hand auger borings were each advanced to a depth of 4 feet below the surface. In conjunction with these hand auger borings, DCP testing was performed at approximate one-foot intervals in each boring in general accordance with ASTM STP 399, "Dynamic Cone for Shallow In-Situ Penetration Testing" to provide us with an index for estimating soil strength parameters and relative consistency of the near-surface soils encountered.
- The subsurface water levels at test locations were measured in the field at the time of our field work or were interpreted from CPT pore pressure readings.
- A test location sketch showing the approximate locations of the soundings and hand auger borings is attached in Appendix I as Figure 2.

Information obtained in the preliminary geotechnical exploration of this site was also utilized in our analysis. The preliminary exploration included the following tasks:

- We established the locations of three CPT soundings, labeled C-1 through C-3, at various locations across the site.
- Soundings C-1 through C-3 were performed to depths ranging from approximately 21.7 to 40.8 feet below the existing ground surface.
- In conjunction with the SCPT sounding at location C-2, shear wave velocity measurements were recorded at approximate 1 meter depth intervals to the sounding termination depth of 40.8 feet.
- We advanced a hand auger boring at each of the CPT sounding locations to observe the near surface soils (C-1 through C-3) to a target depth of 4 feet each.
- We advanced three additional hand auger borings (HA-1 through HA-3) to a target depth of 4 feet each. Conventional DCP testing was performed within these borings at regular depth intervals of approximately 1 foot each in general accordance with ASTM STP 399 procedures.

A brief description of the field exploration procedures performed in the preliminary and final geotechnical explorations, as well as the sounding and hand auger boring logs obtained in each exploration, is attached in Appendix II.

2.2 Laboratory Testing

After the recovered soil samples were brought to our laboratory, a geotechnical professional examined and/or tested each sample to estimate its distribution of grain sizes, plasticity, moisture condition, color, presence of



lenses and seams, and apparent geologic origin in general accordance with ASTM D 2488, "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)".

The resulting classifications are presented on the hand auger boring logs, included in Appendix II. Similar soils were grouped into representative strata on the logs. The strata contact lines represent approximate boundaries between soil types. The actual transitions between soil types in the field are likely more gradual in both the vertical and horizontal directions than those which are indicated on the logs.

We performed the following quantitative ASTM-standardized laboratory tests to help classify the soils and formulate our conclusions and recommendations. The laboratory tests performed in the preliminary exploration and the final exploration included the following:

- One bulk sample and five grab samples tested in general accordance with ASTM D 2216, "Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass", to measure the in situ moisture content of the soil.
- One bulk sample and one grab sample tested in general accordance with ASTM D 1140, "Standard Test Methods for Amount of Material in Soils Finer than No. 200 (75- μ m) Sieve", to measure the percent clay and silt fraction.
- One bulk sample and one grab sample tested in general accordance with ASTM D 4318, "Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils", to measure the plasticity of the soil.
- One bulk sample tested in general accordance with ASTM D 698, "Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 lbf/ft³)", to measure the moisture-density relationship of the soil.
- One bulk sample recompacted and tested in general accordance with ASTM D 1883, "Standard Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils", to evaluate soil support characteristics for pavements.
- Two grab samples tested in general accordance with ASTM D 2974, "Standard Test Methods for Determining the Water (Moisture) Content, Ash Content, and Organic Material of Peat and Other Organic Soils", to measure the organic content of the plowzone.

The laboratory test results and procedures for the above listed tests are attached to this report in Appendix III.

3.0 Site and Surface Conditions

This section of the report describes the general site and surface conditions observed at the time of our exploration.

3.1 Existing Ground Cover

The site consists of a fallow agricultural field with some relatively short surface vegetation on the surface. There are ditches traveling parallel to Fleetwood Road and SC Highway 9. Standing water was not observed on a widespread basis across the site surface at the time of our exploration.



3.2 Topography

The site appears to be relatively level, with less than a few feet of elevation change across the site excluding the ditches; however, a topographic site plan was not provided to us and it was outside the scope of our work to survey the site. As a result, the existing ground surface elevation was set to zero for the purposes of this exploration and this is reflected on the sounding logs and the interpreted cross-sectional subsurface soil profile.

3.3 Plowzone

Plowzone was encountered in each of our hand auger borings and was measured to range in thickness from 6 inches to 12 inches, averaging approximately 9 to 10 inches across the site. Plowzone thickness may be greater in unexplored areas. Plowzone was typically classified as a clayey sand (USCS classification "SC") or silty sand (SM) with trace organics. The organic content measured in the upper 6 inches of the plow zone at two test locations (HA-1 and C-3) ranged from 2.5 to 2.8 percent by weight.

3.4 Local Geology

The project site is located in the Atlantic Coastal Plain physiographic province, or more specifically, the lower Coastal Plain of South Carolina. The Coastal Plain extends from the eastern limit of the Piedmont ("Fall Line") eastward to the coast and consists of a wedge-shaped deposit of ancient marine sediments of the Late Cretaceous Period and younger. Coastal Plain soils comprise interbedded layers of normally-consolidated and over-consolidated limestone, gravels, sands, silts, and clays. This deposit ranges in thickness from near zero at the Fall Line to thousands of feet at the coast. In the site area, depth to crystalline metamorphic rock is likely on the order of about 800 to 1,000 feet.

A review of local geologic mapping indicates that the site area lies within the outcrop area of the Bear Bluff Formation (Tb), typically inter-layered terrestrial clays, silts, sands, and shell beds laid down during the Upper Pliocene Epoch approximately 1.8 to 2.4 million years ago. These materials weathered in place and have formed a mantle of clays and sands which overlie less weathered, much older, calcareous soils. The surface has been reworked by erosional processes over geologic time, and the limestone residuum has been masked by deposits of loose to dense sands or stiff to very stiff clays and silts. The upper contact of the lower sands may be irregular due to localized scouring and redeposition of the overlying clays.

3.5 SCS Soil Series (Near-Surface Soils)

According to the *Soil Survey of Horry County, South Carolina* prepared by the United States Department of Agriculture, Natural Resources Conservation Service (USDA NRCS), the mapped near-surface soils at the site appear to consist primarily of the soil series listed in Table 3-1. The general boundaries of each soil series on the site are shown on Figure 6 attached in Appendix I.



Table 3-1: Soil Survey Data

Soil Series (symbol)	Typical Flooding Risk	Drainage Capacity	Typical Frequency of Surface Water Ponding	Typical Depth to Seasonal High Water Table	Approx. Percentage of Site Area
Goldsboro loamy fine sand (GoA)	None	Moderately High to High	None	About 24 inches	77
Lynchburg loamy fine sand (Ln)	None	Moderately High to High	None	About 18 inches	22
Woodington fine sandy loam (Wo)	None	High	None	About 0 to 12 inches	1

It is important to note that the *Soil Survey* mapping data only considers the upper 6 feet of the natural soil profile.

4.0 Subsurface Conditions

The generalized subsurface conditions at the site are described below. For more detailed descriptions and stratifications at test locations, the respective sounding and hand auger boring logs should be reviewed in Appendix II.

4.1 Interpreted Subsurface Profile

An interpreted subsurface cross-sectional profile of the site soils is attached as Figure 3 in Appendix I to illustrate a general representation of the subsurface conditions within the proposed construction area. The cross-section orientation in plan view is shown on Figure 2. Profile A-A' (Figure 3) depicts the subsurface conditions across the site, looking in a westerly direction.

The strata indicated in the profile are characterized in the following section. Note that the profile is not to scale and was prepared for illustrative purposes only. Subsurface stratifications may be more gradual than indicated, and conditions may vary between test locations. Soil classifications are based on the soil behavior type (SBT)¹ as tabulated in the CPT data within each sounding.

¹ Soil Behavior Type (SBT) is calculated based on empirical correlations with tip resistance, sleeve friction, and pore pressure. A CPT may define a soil based on its behavior as one type while its grain size and plasticity, the traditional basis for soil classification, may define it as a different type.



Soils presented on the profile were grouped into two general strata based on estimated physical properties derived from the borings and the recovered samples. The strata encountered are labeled I and II on the soil profile to allow their properties to be systematically described.

4.2 Description of Subsurface Soils

This section describes subsurface soil conditions observed at the site as illustrated on the profile.

4.2.1 *Stratum I: Upper Cohesive Soils (Silts, Clays, and Clayey Sands)*

Underlying the topsoil, a stratum of cohesive soils was encountered within each of our hand auger borings to their termination depths of 4 feet below the existing ground surface. Soil types within the hand auger borings typically consisted of fat clay (USCS Classification "CH"), sandy fat clay (CH), and clayey sand (SC). These soils were typically various shades and combinations of yellow, brown, gray, orange, and red in coloration and were moist to wet upon recovery. DCP values within this stratum ranged from weight-of-hammer (WOH), where only the weight of the DCP hammer and tooling was required to advance three 1 ¾ inch increments, to 14 blows per increment (bpi), indicating a very soft to stiff consistency. Generally, DCP values within the top couple of feet ranged from about 2 bpi to 6 bpi, indicating a typically very soft to firm consistency.

Within the CPT soundings, this stratum exhibited SBT of clay, very stiff fine-grained soils, silt mixtures, and sand mixtures to depths ranging from about 25 feet to 28 feet below the surface. The soils of Stratum I typically exhibited tip resistances typically ranging from about 5 tons per square foot (tsf) to about 40 tsf, indicating a typically soft to very stiff consistency within the silts and clays and a very loose to loose relative density within the sands.

A composite bulk sample was collected from the upper portion of Stratum I and subjected to natural moisture content, grain size distribution, plasticity, Proctor, and California Bearing Ratio (CBR) testing. The soil was collected from hand auger borings HA-1 through C-3 between depths of about 6 inches to 2 ½ feet during the preliminary exploration of this site. The sample was classified as fat clay (CH) with a fines content of 86.3 percent by weight passing the No. 200 sieve, a liquid limit of 52 percent, a plastic limit of 26 percent, and a plasticity index of 26 percent. The natural moisture content was measured to be 22.4 percent. The standard Proctor maximum dry density was 100.5 pounds per cubic foot (pcf) at an optimum moisture content of 10.4 percent, indicating that the soil in place is about 12 percent wet of its optimum moisture content. The CBR value of a remolded sample of this soil was measured to be 2.8 percent at 98.4 percent compaction (ASTM D 698), indicating poor capacity for direct pavement section support.

4.2.2 *Stratum II: Lower Medium Dense to Very Dense Sands*

Underlying Stratum I and continuing to the maximum exploration depth of about 43 feet beneath the existing ground surface, Stratum II primarily consisted of medium dense to very dense sands. Tip resistances of this stratum ranged from about 60 tsf to 400 tsf, indicating a medium dense to very dense relative density.



4.2.3 Summary of Laboratory Test Results

Over the course of our preliminary exploration and this exploration, we performed laboratory testing upon one composite bulk sample and seven grab samples to assess the engineering properties of subsurface soils, as discussed in the preceding sections of this report. The individual laboratory soil index test results are presented in the appendix, and the results are summarized in the following tables.

Table 4-1: Summary of Laboratory Soil Index Testing Results

Boring/ (Sample No.)	Sample Depth (ft.-ft.)	Natural Moisture Content (%)	Silt/Clay Fines Content (%)	Organic Content (%)	Atterberg Plasticity Limits (%)			USCS Classification
					LL	PL	PI	
HA-1 to C-3/ (BS-1)	0.5'-2.5'	22.4	86.3	---	52	26	26	CH
HA-3/(S-1)	1'-1.5'	18.3	67.1	---	56	23	33	CH
C-1/(S-2)	1'-1.5'	22.9	---	---	---	---	---	CH ⁽¹⁾
HA-1/(S-3)	0-0.5'	20.1	---	2.5	---	---	---	SC ⁽¹⁾
C-3/(S-4)	0-0.5'	23.5	---	2.8	---	---	---	SC ⁽¹⁾
HA-4/(S-1)	2'-2.5'	24.7	---	---	---	---	---	SC ⁽¹⁾
HA-6/(S-2)	1'-1.5'	25.8	---	---	---	---	---	SC ⁽¹⁾
HA-7/(S-3)	2'-2.5'	28.7	---	---	---	---	---	CH ⁽¹⁾

⁽¹⁾ Visual-Manual Classification, not directly tested

Table 4-2: Moisture-Density and CBR Test Results

Boring/ (Sample No.)	Sample Depth (ft.-ft.)	USCS Soil Type	Standard Proctor (ASTM D 698)		Natural Moisture Content (%)	CBR at 98% Compaction and 0.1 in. Penetration (%)
			Maximum Dry Density (pcf)	Optimum Moisture Content (%)		
HA-1 to C-3/ (BS-1)	0.5'-2.5'	Fat Clay (CH)	100.5	10.4	22.4	2.8

4.3 Subsurface Water and Perched Groundwater Risk

Subsurface water was interpreted based on pore pressure readings within the CPT soundings at depths ranging from 2 ½ feet to 4 below the ground surface within each sounding. Subsurface water was encountered within each of the six hand auger borings from the preliminary exploration and five of six hand auger borings from this exploration. Subsurface water was encountered at depths ranging from 8 inches to 41 inches below the existing ground surface in the hand auger borings in which water was encountered.



Based on the soil types encountered, this site is *highly susceptible* to the development of a shallow perched water table, particularly during times of wet weather, as encountered during both the preliminary exploration and this final exploration. Subsurface water levels may fluctuate seasonally at the site, being influenced by rainfall variation and other factors. Site construction activities can also influence water elevations.

5.0 Seismic Site Class and Design Parameters

Seismic-induced ground shaking at the foundation is the effect taken into account by seismic-resistant design provisions of the International Building Code (IBC). Other effects, including landslides and soil liquefaction, must also be considered.

5.1 Building Code Seismic Provisions

As of January 1, 2023, the 2021 edition of the International Building Code (IBC) has been adopted for use in South Carolina. We classified the site as one of the Site Classes listed in the IBC Section 1613.3, using the procedures described in Chapter 20 of ASCE 7-16.

5.1.1 Evaluation of the Potential for Site Class F Conditions

The initial step in site class definition is to check for the four conditions described for Site Class F, which would require a site specific evaluation to determine site coefficients F_A and F_V . Soils vulnerable to potential failure include the following: 1) quick and highly sensitive clays or collapsible weakly cemented soils, 2) peats and highly organic clays, 3) very high plasticity clays, and 4) very thick soft/medium stiff clays. These soils were not evident in the borings or soundings.

One other determining characteristic, liquefaction potential under seismic conditions, was assessed. Soils were assessed qualitatively for liquefaction susceptibility based on their age, stratum, mode of deposition, degree of cementation, and size composition. This assessment considered observed liquefaction behavior in various soils in areas of previous seismic activity.

Liquefaction of saturated, loose, cohesionless soils occurs when they are subjected to earthquake loading that causes the pore pressures to increase and the effective overburden stresses to decrease, to the point where large soil deformation or even transformation from a solid to a liquid state results. Earthquake-induced ground surface acceleration at the site was assumed from the building code design peak ground acceleration of 0.213g according to the 2021 IBC.

Our analysis, which is more fully described below, indicates that liquefaction of subsoils appears unlikely to occur on a widespread basis at this site in the event of the design magnitude earthquake; therefore, Site Class F does not apply.

5.1.2 Liquefaction Potential Index (LPI)

To evaluate liquefaction potential, we performed analyses using the data obtained in the borings, considering the characteristics of the soil and water levels observed in the boring. The liquefaction analysis was performed based



on the design earthquake prescribed by the 2021 edition of the International Building Code, the “simplified procedure” as presented in Youd et al. (2001), and research concerning the liquefaction resistance of aged sands (Hayati & Andrus, 2008; Andrus et al. 2009; Hayati & Andrus, 2009).

To help evaluate the consequences of liquefaction, we have computed the Liquefaction Potential Index (LPI), which is an empirical tool used to evaluate the potential for liquefaction to cause damage. The LPI considers the factor of safety against liquefaction, the depth to the liquefiable soils, and the thickness of the liquefiable soils to compute an index that ranges from 0 to 100. An LPI of 0 means there is no risk of liquefaction; an LPI of 100 means the entire profile is expected to liquefy. The level of risk is generally defined below.

- **$LPI < 5$** – surface manifestation and liquefaction-induced damage not expected.
- **$5 \leq LPI \leq 15$** – moderate liquefaction with some surface manifestation possible.
- **$LPI > 15$** – severe liquefaction and foundation damage is likely.

The LPI for this site under the 20121 Code is less than 5, which indicates that the risk of surface damage due to liquefaction is relatively low across the site. Therefore, we consider that Site Class F conditions do not apply, and based upon the shear wave velocity tests that we performed, the soil conditions within this site are determined to be Site Class D.

5.1.3 *Shear Wave Velocity Test Results*

Based upon the extrapolated shear wave velocity obtained in the preliminary geotechnical exploration, this site is determined to be **Site Class D**. This recommendation is provided based on the shear wave velocity measured at test sounding C-2 to a depth of 40.8 feet, and then extrapolated to a depth of 100 feet. When extrapolated to a depth of 100 feet, an average shear wave velocity of 659 fps is estimated, which is greater than the 600 fps that is required for consideration of Site Class D parameters. See Figure 4 in Appendix I for the shear velocity profile.

5.2 Seismic Design Coefficients for Site Class D

Selection of the base shear values for structural design for earthquake loading is the responsibility of the structural engineer. However, for the purpose of evaluating seismic hazards at this site, S&ME has evaluated the spectral response parameters for the site using the general procedures outlined under the 2021 International Building Code. We understand that this structure will be Risk Category IV since it is a fire station.

Table 5-1: Seismic Design Coefficients

Criteria	Seismic Site Class	S_s	S_1	S_{DS}	S_{D1}	PGA_M	Seismic Design Category (Risk Cat. IV)
2021 IBC/ ASCE 7-16	D	0.266	0.102	0.281	0.163	0.213	D



5.2.1 Seismic Design Category

For a structure having a Risk Category classification of IV under the 2021 Code, the S_{DS} and S_{D1} values obtained are consistent with "Seismic Design Category D" as defined in section 1613 of the IBC.

6.0 Conclusions and Recommendations

The conclusions and recommendations included in this section are based on the project information outlined previously and the data obtained during our exploration. If the construction scope is altered, the proposed building location is changed, or if conditions are encountered during construction that differ from those encountered by the borings or soundings, then S&ME, Inc. should be retained to review the following recommendations based upon the new information and make any necessary changes.

6.1 Site Preparation

Based on the findings of our exploration, we offer the following recommendations regarding stabilization of the subgrade soil conditions within the site.

1. Drainage by ditching should be implemented and maintained as soon as possible prior to and during construction to lower the shallow perched water table level and divert water away from the construction area. At the time of our preliminary exploration and this exploration, groundwater was encountered at relatively shallow depths within the hand auger borings and CPT soundings. Although not significantly encountered during our explorations, we suspect that water may pond on the site surface during periods of unfavorable weather.
 - A. Drainage will likely need to consist of a series of gravity-drained ditches around the perimeter of the construction areas and "finger" ditches spaced at regular intervals within the construction area.
 - B. In some cases, it may be advisable that these ditches be converted to permanent underdrains by the addition of fabric wrapped washed gravel, to help provide long-term subsurface positive drainage for the facility.
 - C. The ditches should be excavated to such a depth that would allow a minimum separation of at least 3 feet between planned subgrade elevations and the ground water elevation. Ditches should have sufficient relief to facilitate gravity flow.
 - D. Groundwater levels should be re-evaluated by a representative of the Geotechnical Engineer just prior to beginning the grading phase of the project to allow us to better refine these recommendations. Even during hot or dry weather, the grading contractor should take measures so that periodic rain showers do not significantly affect grading. This includes diverting rainwater runoff away from the construction area and shaping the ground surface to help prevent rainwater runoff from ponding and migrating into the surface soils.
 - E. Implementing good drainage prior to the primary earthwork effort in order to control as much of the near-surface perched water as possible will be critical to facilitating the start of earthwork.
2. Strip surface vegetation, root mat, and organic-laden or debris-laden soils, and the upper 6 inches of plowzone where encountered and dispose of outside the building and pavement footprints. Soils



containing more than about 5 percent organics by weight should be removed from the proposed construction areas.

- A.** Although the plowzone samples tested during our preliminary exploration exhibited organic contents of less than 5 percent, we recommend at least the upper 6 inches of plowzone should be removed to rid the site of crop roots. The stripping depth should be increased where remaining plowzone soils appear to contain more than 5 percent by weight of organics.
- 3.** Fat clays (CH) were encountered in the upper soil profile at the site. These soils may pump, rut and become unstable under construction equipment when they are wet, and may be difficult to dry out once they become wet. Be prepared that these unfavorable conditions will be exacerbated during periods of wet weather.
 - A.** **Due to the anticipated need to undercut and replace unsuitable surface soils on this site, we recommend that you obtain a price per cubic yard in advance from your contractor for excavation of unsuitable soils and replacement with select fill imported from offsite and create an allowance in your project development budget for this line item.**
- 4.** After the surface has been stripped, the existing subgrade surface should be densified in-place with a heavy sheepsfoot roller operating in static (non-vibratory) mode prior to placement of any new fill. The densification of the surface should be performed under the observation of an S&ME representative. After surface densification but prior to placement of any new fill, have a representative of the Geotechnical Engineer observe the prepared surface for stability. This may consist of a visual observation of a proofroll, performed by the contractor, in all areas to receive fill to confirm stability prior to fill placement. It is anticipated that some areas of the cut grade may be too unstable to proofroll, even after the surface is prepared.
 - A.** Where stable conditions cannot be achieved by traditional means (drying, etc.), a soil-reinforcing woven geotextile such as TenCate Mirafi model HP-370 or HP-570 may be required to be placed on the subgrade in order to stabilize the surface sufficiently to allow the first lift of fill material to be placed and compacted. **We recommend that you obtain a unit price for these geotextiles and their installation from the contractor at bid time to prepare for this contingency, and create an allowance in your project development budget for this line item.**
 - B.** Based upon the results of the proofroll, it may also become necessary to perform undercutting and replacement of unstable soils. This should be a decision made at the time of construction in consultation with the Geotechnical Engineer based upon the conditions observed. Caution should be used during any undercutting operations due to the shallow groundwater table observed on site.
 - C.** The earthwork should be observed by a representative of the Geotechnical Engineer, so that recommendations regarding the undercut depth and the use of geotextiles in excavation bottoms can be made at the time of construction.
- 5.** Pavement areas should also be proofrolled at soil subgrade elevation under the observation of a representative of the Geotechnical Engineer (S&ME). If any areas of instability are observed during the proofroll, further stabilization should be performed, as determined by the Geotechnical Engineer.



6.2 Fill Placement and Compaction

Where new fill soils are to be placed, the following recommendations apply:

1. Prior to fill placement, sample and test each proposed fill material to determine suitability for use, maximum dry density, optimum moisture content, and natural moisture content. It is recommended that the fill soils used to build up the pad for the structure and pavements meet the following minimum requirements:
 - A. Plasticity index of 6 percent or less (ASTM D4318);
 - B. Clay/silt fines content of not greater than 15 percent (ASTM D1140);
 - C. Natural moisture content within 3 percent of the optimum moisture content for compaction (ASTM D1557).
 - D. Typically, this would include USCS soil classifications SW, SP, SW-SC, SW-SM, SP-SC, and SP-SM.
 - E. Based upon our laboratory test data, the soils observed at our test locations do not appear likely to meet these criteria due to wetness, excess clay content, and excess plasticity, so it should be anticipated that near-surface on-site soils that are excavated during construction are likely to be **unsuitable** to re-use as structural backfill. Therefore, the contractor should plan to **import all fill soil** to be used for the site development.
2. Where fill soil is required, the first lift of fill placed over the native clay subgrade should be compacted to at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557). The remainder of the structural fill (other than the first lift) should be compacted throughout to **at least 98 percent** of the modified Proctor maximum dry density (ASTM D 1557).
 - A. This is a higher degree of compaction than is normally specified for commercial projects, but is appropriate in this case due to the very heavy loads that are transferred to the subgrade by the fire trucks that are anticipated to use this facility.
 - B. Compacted soils should not exhibit pumping or rutting under equipment traffic.
 - C. The first lift of structural fill placed over the native clay subgrade may be placed 12 to 14 inches thick. Loose lifts of fill after the first lift should be no more than 10 inches thick prior to compaction; reduce the maximum lift thickness to 6 inches if using small, portable compaction equipment such as walk-behind vibrating plate tamps or reciprocating tamps ("jumping jacks").
 - D. Structural fill should extend at least 5 feet from the edge of structures and pavements before being allowed to exhibit a lower level of compaction.
3. Where present, the subsurface water level should be maintained at least 2 feet below any surface to be densified prior to beginning compaction. This is to reduce the risk of the compaction operations drawing water up to the surface and deteriorating it.
4. Fill placement should be observed by an experienced S&ME soils technician working under the guidance of the Geotechnical Engineer. In general, at least one field density test for every 5,000 square feet should be conducted for each lift of soil in large area fills, with a minimum of 2 tests per lift. At least one field density test should be conducted for each 300 cubic feet of fill placed in confined areas such as isolated undercuts and in trenches, with a minimum of 1 test per lift.



6.3 Shallow Foundations

Based on the assumed structural loads, estimated magnitudes of post construction static settlement are on the order of 1 inch total and ½ inch differential due to just the static weight of the structure; however, this does not account for ground settlement due to the weight of the new fill. Assuming that the site is to be filled about 3 feet above existing grades within the building footprint, settlements greater than 1 inch total and ½ inch differential are expected to occur.

Based on the existing clayey soil profile and considering the structural loads and 3 ft. permanent fill embankment, the static settlement magnitudes due to the weight of the building and the fill embankment are expected to be about 1 ¾ inches of total settlement and ¾ inch of differential settlement. If the structure can be designed to tolerate this amount of post-construction settlement, then the construction may follow a standard construction timeline; however, this is expected to be unlikely.

Therefore, we recommend that you follow the site preparation steps in Sections 6.1 and 6.2 of this report, filling the site to final soil subgrade (FSG) elevation, and then **allow the fill embankment (building pad) to settle for at least 30 days prior to constructing the building foundations**. This waiting period will allow the compressible subsoils to consolidate (settle) somewhat under the weight of the new fill embankment and will help mitigate the excessive settlement risk associated with the weight of the fill, leaving approximately 1 inch of total post-construction static settlement and ½ inch of static differential post-construction settlement due to the weight of the building alone.

- Be sure to allow time in the project construction schedule for this 30-day waiting period.

After implementing this 30-day waiting period, the soil profile of the site appears generally suitable to support the proposed building with shallow foundations. The design engineer needs to confirm that the assumed maximum loads are correct; if actual loads are higher, we should be notified and given a reasonable opportunity to reconsider these recommendations, because it could result in changes to the estimated available bearing capacity and static settlement magnitudes.

- If more than 3 feet of fill is to be added to the site to achieve finished floor elevations, we should be contacted as the consolidation waiting period may need to be extended for a longer duration, or a temporary fill embankment may be required to be placed above finished grade (surcharging).

The following recommendations are provided for the design and construction of shallow foundations at this site for the proposed fire station, after the minimum 30-day consolidation waiting period is complete:

1. Provided that the recommendations in Sections 6.1 to 6.3 of this report are implemented, the proposed structures may be supported on shallow foundations using isolated spread footings and slab-on-grade construction as planned. A net available bearing pressure of up to **2,000 psf** may be used for design of individual spread footings and wall footings that are extended to bear within residual coastal plain deposits or within structural fill compacted as recommended in Section 6.2 of this report.
2. Lateral capacity of foundations includes a soil lateral pressure and coefficient of friction as described in IBC Section 1806. Assuming that the footings will bear within the compacted fill or compacted similar native surface sands, the foundations will be embedded in material similar to those described as Class 4 in



Table 1806.2. Where footings are cast neat against the sides of excavations in natural soils, an allowable bearing pressure of 150 psf per foot depth below natural grade may be used in computations. An allowable coefficient of friction of 0.36, multiplied by the dead load, may be used for computation of sliding resistance. An increase of one-third in the allowable lateral capacity may be considered for load combinations, including wind and earthquake, as permitted by IBC Section 1605.3.2, unless otherwise restricted by design code provisions.

3. Even if smaller dimensions are theoretically allowable from a bearing pressure consideration, the minimum column footing width should be 30 inches and the minimum wall footing width should be 18 inches, to avoid punching shear. Spread footings should be embedded to a minimum depth of 12 inches or to the depth indicated on the drawings, whichever is greater.
4. Dynamic Cone Penetrometer (DCP) testing should be performed by a representative of the Geotechnical Engineer at representative locations within the open foundation excavations in order to evaluate the available bearing capacity of the soils.
 - A. In cases where the DCP testing indicates insufficient bearing capacity for the applied bearing pressure, the foundation bearing soils may need to be over-excavated and replaced with stronger material within the upper few feet beneath the footing bearing grade elevation. **There is a high probability that this scenario may occur on a widespread basis across this site.**
 - B. Where soft or loose soils are encountered within the footing excavations and are removed, we recommend that an open-graded, coarse, washed, crushed, manufactured granitic gravel meeting the gradation requirements of SCDOT No. 57 or No. 67 stone be used as the backfill material to replace any over-excavated soils. The depth of the recommended over-excavation will need to be a case-by-case decision made at the time of construction based upon the results of the DCP testing, and should be evaluated by the Geotechnical Engineer.
 - C. Also, have the Geotechnical Engineer observe any undercut areas in footings prior to backfilling, in order to confirm that the poor soils have been removed and that the exposed subgrade is suitable for support of footings or backfill.
 - D. It should be anticipated that where footings bear directly on fill, the previously placed fill soils exposed in the bottom of the footings may need to be tamped to increase their density prior to the placement of foundation concrete.
5. The following discussion is provided regarding the estimated magnitude of post-construction settlements under static loading **after implementing the 30-day waiting period** between the completion of fill placement to final soil subgrade (FSG) elevation and the start of footing construction:
 - A. Based on an assumed maximum column load of 75 kips, and considering a uniformly applied area load of 250 psf (slab loading + slab self-weight), and a 2,000 psf shallow foundation bearing pressure, the estimated total post-construction static settlement of an individual spread footing measuring roughly 6 feet by 6 feet in plan area will likely be about 1 inch.
 - B. Based on an assumed wall load of 5 kips per linear foot, and considering a uniformly applied area load of 250 psf, and a 2,000 psf shallow foundation bearing pressure, the estimated static post-construction settlement of an individual wall strip footing at least 2.5 feet wide will likely be about 1 inch.



- C. Differential settlements between adjacent, similarly loaded walls and columns are typically on the order of 50 percent of the total post-construction settlement value under static loading, or in this case, ½ inch.

6.4 Grade Slab Support and Construction

The following recommendations are given for the support and construction of soil-supported grade slabs:

1. Soils similar to those recommended for use as imported structural fill in Section 6.2 of this report are anticipated to provide adequate support to proposed soil-supported grade slabs, assuming preparation and compaction of the subgrade as recommended above. A modulus of subgrade reaction (k) of 125 lbs/in³ (pci) is recommended for use for reinforcing design.
2. A plastic vapor barrier should be placed over the subgrade prior to placing concrete to limit moisture infiltration into finished spaces.
3. Place a layer of compacted granular material below the interior floor slab. In the fire and rescue vehicle truck bays, this layer should be at least 6 inches thick; it may be reduced to a 4-inch thick layer in non-vehicle supporting areas of the floor slab if so specified by the structural engineer. Granular materials used may consist of a crushed, well-graded gravel blend meeting the requirements of SCDOT Graded Aggregate Base Course (GABC) as defined by Section 305 of the SCDOT Standard Specifications for Highway Construction, 2007 edition, or an open-graded, manufactured washed gravel meeting the gradation requirements of SCDOT No. 57 or No. 67 stone.
 - A. If washed (No. 57/67) gravel is used as the underslab layer, then the contractor should plan on using a pump truck to place the floor slab concrete since these materials are cohesionless and are difficult to drive vehicles on.
 - B. If GABC is used, then either a pump truck or direct discharge from concrete batch trucks may be appropriate depending upon the circumstances.
 - C. If GABC is used, this underslab layer should be compacted to at least 98 percent of the modified Proctor maximum dry density (ASTM D 1557), and tested for density by a representative of S&ME.
4. Have a representative of the Geotechnical Engineer observe a proofroll of all slab subgrades prior to concrete placement. Softened soils may need to be undercut or stabilized before concrete placement.

6.5 Pavement Section Design and Construction

Flexible (asphalt) pavements are not recommended for use in areas that will be traveled by the fire trucks and rescue vehicles. Only rigid Portland cement concrete pavements should be used in those areas. Flexible pavements may only be used in the employee parking lot.

We assume that new pavement subgrades will be constructed atop a subbase layer of compacted structural fill soils compacted to **at least 98 percent** of the modified Proctor maximum dry density. This is a higher degree of compaction than is normally specified for commercial projects, but is appropriate in this case due to the very heavy loads that are transferred to the subgrade by the fire trucks that are anticipated to use this facility. We have performed our evaluations assuming that a CBR value of at least 10 percent will be available from structural fill soils compacted to 98 percent, which is typical of well compacted sandy soils. If soils exhibiting a CBR value of



less than 10 percent at 98 percent compaction are to be used on this project, these recommendations may require revision.

- In flexible (asphalt) pavement areas, the sandy subbase fill layer beneath the base course should be at least 24 inches thick.
- In rigid (Portland cement concrete) pavement areas, the sandy subbase fill layer beneath the drainage and base layers should be at least 18 inches thick (see also Figure 5 in Appendix I).

Traffic volumes for the proposed development were not provided to us in preparation for our exploration and pavement section analysis. Based upon our previous experience on similar fire station projects, we have assumed traffic load information. A required capacity of about 2,000,000 Equivalent Single Axle Loads (ESALs) was estimated for the rigid (concrete) pavements subjected to fire truck/rescue traffic. The volumes for light-duty asphalt pavements are based on an assumption of 60 passenger vehicle or light truck trips per day. Both sections assume a design life of 20 years. The resulting recommended pavement section components are provided in Table 6-1 below.

For flexible pavements, the pavement thickness computations were made using the AASHTO method, assuming an initial serviceability of 4.2 and a terminal serviceability index of 2.0, and a reliability factor of 95 percent. Assuming that only SCDOT approved source materials will be used in flexible pavement section construction, we used a structural layer coefficient of 0.44 for the HMA layers and a coefficient of 0.18 for the graded aggregate base course (GABC).

Rigid pavement design assumes an initial serviceability of 4.5 and a terminal serviceability index of 2.5, and a reliability factor of 85 percent. Assuming that the rigid pavement will be continuously reinforced, we used an average load transfer coefficient of 3.2. We also assumed a minimum 28-day design compressive strength of at least 4,000 psi for the PCC. A sub-base drainage factor of 1.0 was assigned, based upon the assumption that the sub-base soils will consist of granular soils.

If reinforced joint design with appropriate load transfer devices (such as steel dowels) is not provided at all expansion and construction joints, then the rigid pavement section thickness design needs to be reconsidered using a higher load transfer coefficient, which may result in an increase in the pavement section thickness to maintain a similar ESAL capacity.



Table 6-1: Recommended Minimum Pavement Sections^(a)

Pavement Area	Theoretical Applied Traffic Load 20 years (ESALs)	HMA Surface Course Type C (inches)	4,000 psi Continuously Reinforced Portland Cement Concrete (inches)	SCDOT Graded Aggregate Base Course [GABC] (inches)	No. 57/67 Gravel Drainage Layer (inches) over Mirafi HP-370 Geotextile	Sandy Subbase Fill (CBR $\geq$ 10%) (inches)
Heavy-Duty Rigid (Concrete)	2,000,000	---	8.0	6.0	6.0	≥ 18
Light-Duty Flexible (Asphalt)	50,000	2.0	---	6.0	---	≥ 24

(a) Single-stage construction and soil compaction as recommended is assumed; S&ME, Inc. must observe pavement subgrade preparation and pavement installation operations.

See Figure 5 in Appendix I for a typical heavy-duty pavement section detail that we recommend be considered.

6.5.1 Pavement Drainage Systems

The site civil engineer should determine the specific layout of the drainage system for the project based on these recommendations.

1. Within the rigid concrete pavement areas, a gravel drainage blanket layer 6 inches in thickness should be constructed along with the proper base course and pavement section. See also Figure 5 in Appendix I for a typical pavement section detail showing the drainage layer.
 - A. The drainage layer, located between the soil subgrade and the graded aggregate base course, should consist of a washed, open graded, manufactured granitic gravel meeting the gradation of SCDOT No.57 or No. 67 stone. Do not substitute marine limestone gravel.
 - B. Non-woven geotextile filter fabric (TenCate Mirafi 140N) is recommended to be placed between the GABC layer and the drainage layer, to provide separation and filtration;
 - C. Woven geotextile (TenCate Mirafi HP-370) is recommended to be placed between the drainage layer and the subgrade to provide separation and tensile reinforcement.
 - D. The gravel drainage layer should be at least 6 inches in thickness.
2. In addition to the gravel drainage (blanket) layer described above, perimeter underdrains should also be considered by the civil engineer for inclusion in the pavement area design of both the heavy-duty and light-duty parking lot areas due to the presence of the shallow clayey soils that may promote the development of near-surface perched water conditions.



- A.** The site civil engineer should be consulted regarding the type and location of the perimeter underdrains. Our experience is that two types of underdrain systems are commonly used in this locality, depending upon the traffic application and the preferences of the civil engineer. One commonly used system is a gravel-filled, fabric-wrapped trench, or “French drain” containing an embedded perforated plastic HDPE pipe. This type of underdrain is shown as a typical detail on Figure 5 attached in Appendix I. Another type of system that we often see used is an edge drain product such as AdvanEdge by ADS, Inc. This is a fabric-wrapped, perforated HDPE slot style drain. Some engineers have used a combination of these two systems.
- B.** If the civil engineer incorporates perimeter French drains into the subsurface drainage system design, then the French drains should be constructed using the same No. 57 or No. 67 stone, and should be wrapped in a non-woven geotextile, such as Mirafi’s 140N Series fabric. French drains should tie into the nearest storm sewer catch basin, or other discharge points as directed by the site civil engineer.
- 3.** Do not fill landscaped islands with clayey or silty (impermeable) spoils that may impede the movement of water into the underdrains.

6.5.2 General Pavement Section Construction

The following general recommendations are provided regarding pavement construction:

- 1.** Fill placed in pavement areas should be compacted to at least 98 percent of the modified Proctor (ASTM D 1557) maximum dry density as recommended previously in Section 6.2 of this report. Prior to pavement section installation, all exposed pavement area subgrades should be methodically proofrolled at final soil subgrade (FSG) elevation under the observation of S&ME, Inc., and any identified unstable areas should be repaired as directed.
- 2.** The stone base course underlying pavements should consist of a graded aggregate base course (GABC) as specified by the SCDOT 2007 Standard Specifications for Highway Construction, Section 305. Proposed materials for use should be provided by a SCDOT-approved source.

 - ♦ Do not substitute “commercial grade” base course for SCDOT-approved base course material.
- 3.** As stated in the SCDOT Section 305 specification, all new base course in exterior pavement areas should be compacted to at least 100 percent of the modified Proctor maximum dry density (SC T-140). Base courses should not exhibit pumping or rutting under equipment traffic. Heavy compaction equipment is likely to be required in order to achieve the required base course compaction, and the moisture content of the material will likely need to be maintained very near the optimum moisture content in order to facilitate proper compaction. S&ME, Inc. should be contacted to perform field density and thickness testing of the base course prior to paving.
- 4.** Experience indicates that for flexible pavements a thin surface overlay of asphalt pavement may be required in about 10 years due to normal wear and weathering of the surface. Such wear is typically visible in several forms of pavement distress, such as aggregate exposure and polishing, aggregate stripping, asphalt bleeding, and various types of cracking. There are means to methodically estimate the remaining pavement life based on a systematic statistical evaluation of pavement distress density and

Report of Geotechnical Exploration
Finklea Fire Station No. 6

Green Sea, Horry County, South Carolina
S&ME Project No. 23630075A



- mode of failure. We recommend the pavement be evaluated in about 7 years to assess the pavement condition and remaining life.
5. Construct the HMA surface course in accordance with the specifications of Section 403 of the South Carolina Department of Transportation Standard Specifications for Highway Construction (2007 edition). Construct HMA intermediate courses in accordance with the specifications of Section 402 of this same specification.
 6. It is important that the asphaltic concrete be properly compacted, as specified in Section 401 of the SCDOT specification. Asphaltic concrete that is insufficiently compacted will show wear much more rapidly than if it were properly compacted.
 7. Sufficient testing should be performed during flexible pavement installation to confirm that the required thickness, density, and quality requirements of the pavement specifications are followed.
 8. For rigid pavements, we recommend air-entrained ASTM C 94 continuously reinforced Portland cement concrete that will achieve a minimum compressive strength of at least 4,000 psi at 28 days after placement, as determined by ASTM C 39. We also recommend that the pavement concrete be constructed in a manner which at least meets the minimum standards recommended by the American Concrete Institute (ACI).
 9. We recommend that at least 1 set of 5 cylinder specimens be cast by S&ME per every 50 cubic yards of concrete placed or at least once per placement event in order to measure achievement of the design compressive strength. We also recommend that S&ME be present on site to observe concrete placement.

7.0 Limitations of Report

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations in this report are based on the applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

The analyses and recommendations submitted herein are based, in part, upon the data obtained from the subsurface exploration. The nature and extent of variations of the soils at the site to those encountered at our test locations will not become evident until construction. If variations appear evident, then we will re-evaluate the recommendations of this report upon request. In the event that any changes in the nature, design, or location of the structures, pavements, or other appurtenances are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed, and conclusions modified or confirmed in writing by the submitting engineers.

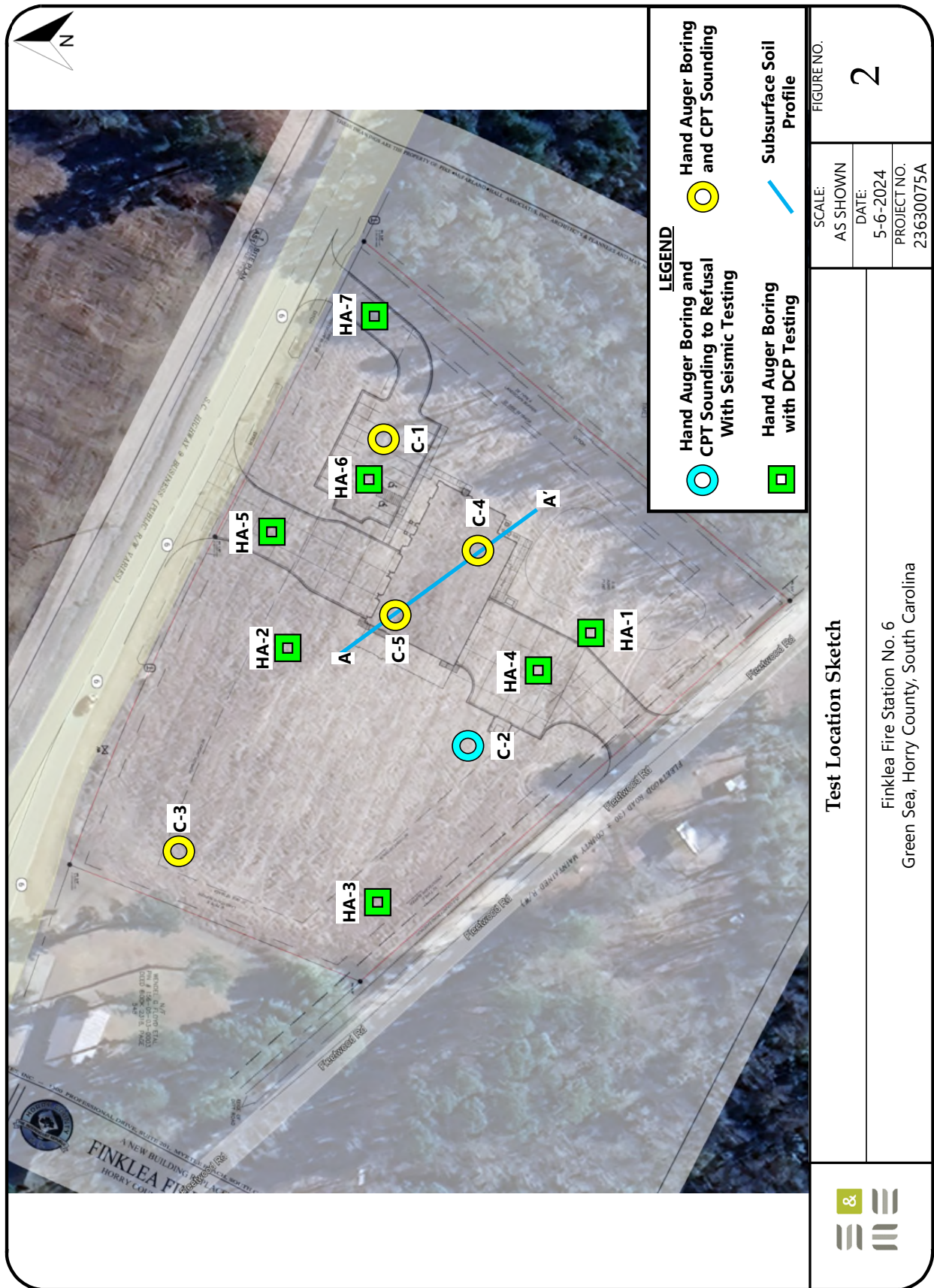
Assessment of site environmental conditions; civil design; structural design; sampling of soils, ground water or other materials for environmental contaminants; identification of jurisdictional wetlands, rare or endangered species, or cultural resources; identification of geological hazards or potential air quality and noise impacts were beyond the scope of this geotechnical exploration.

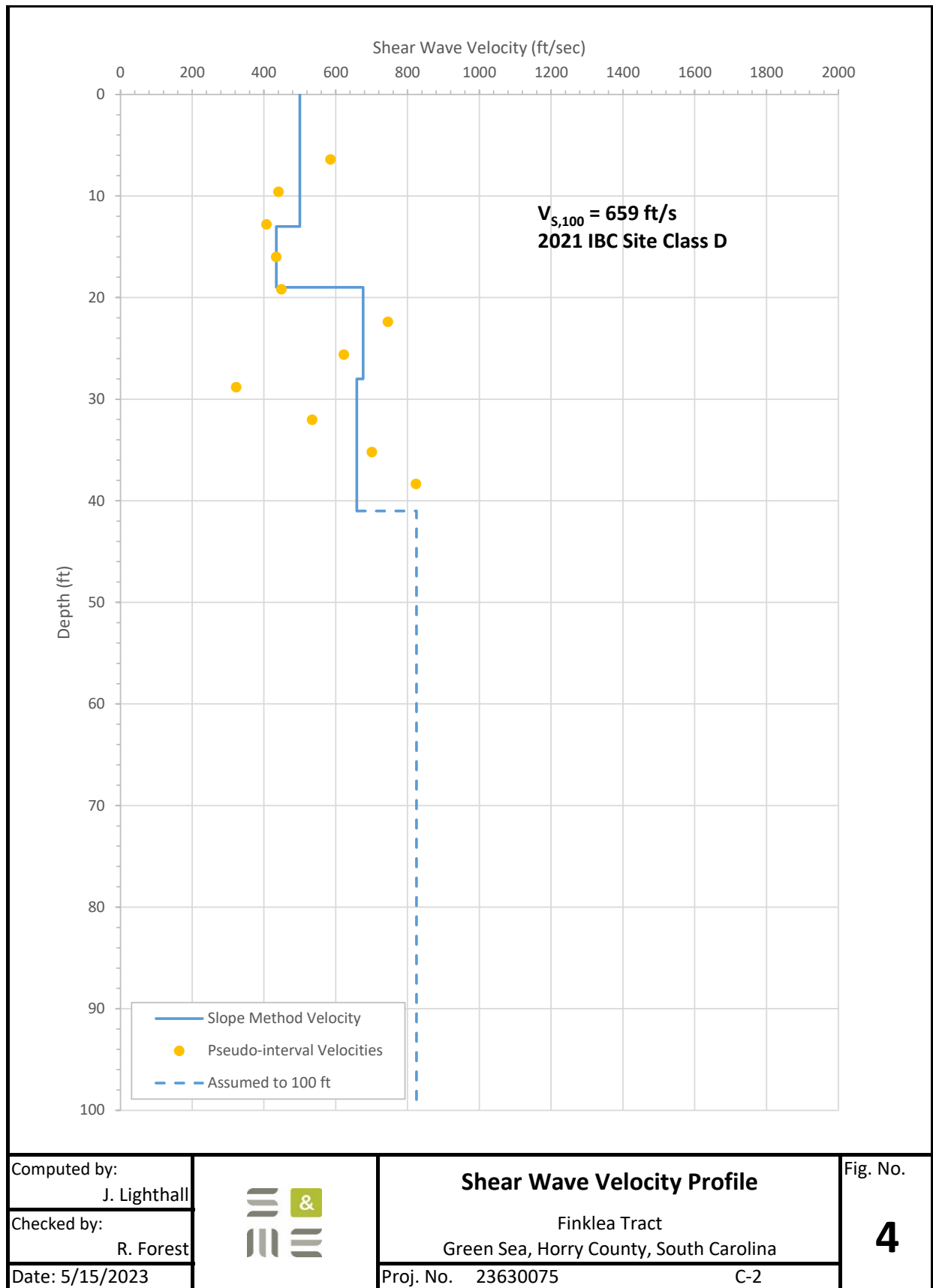
S&ME should be retained to review the final plans and specifications to confirm that earthwork, foundation, and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by our observation and testing of earthwork and foundation construction activities.

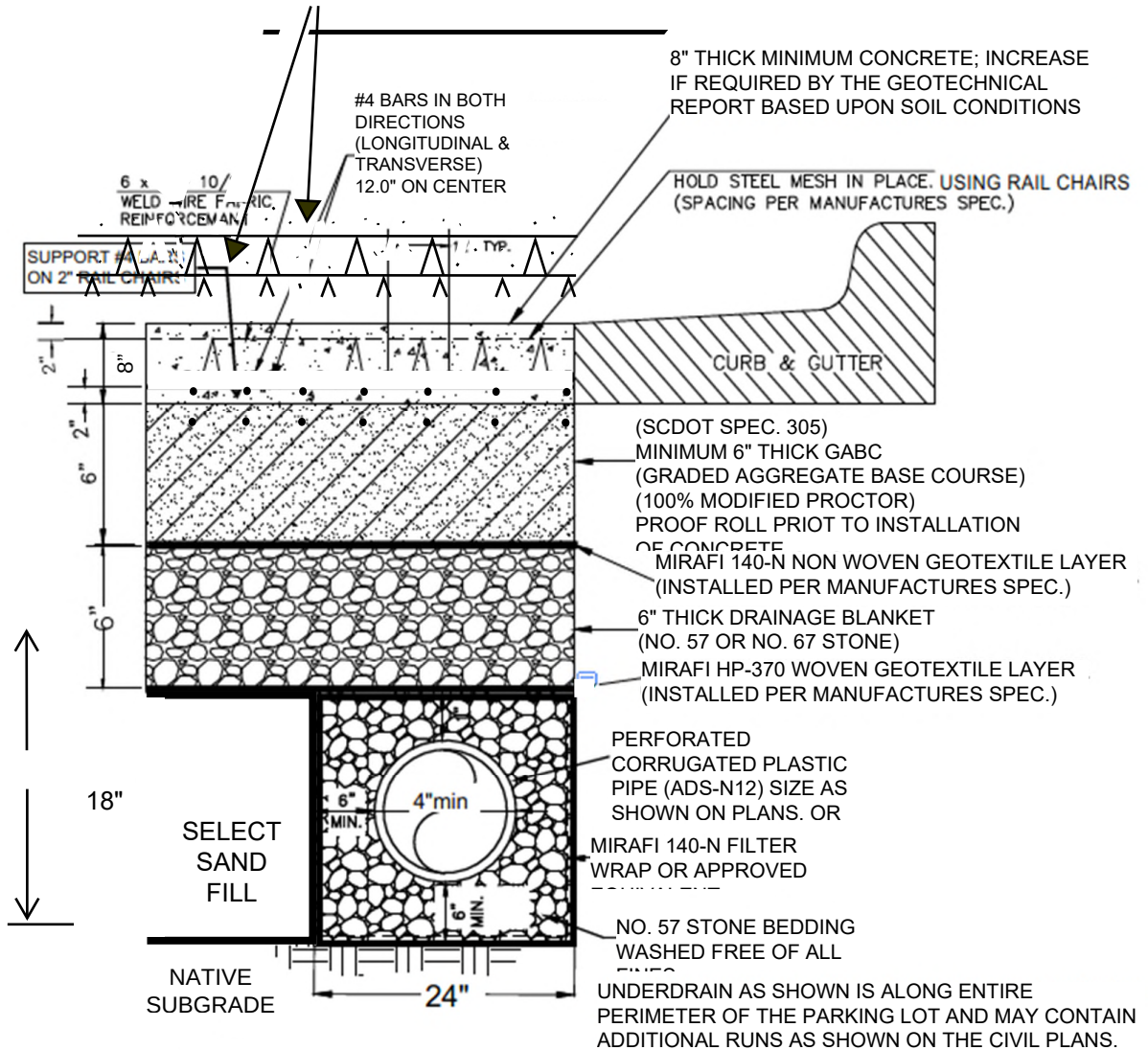
Appendices

Appendix I – Figures









NOTES

1. ALL MATERIALS SHALL MEET APPLICABLE STANDARDS SET FORTH IN THE SCDOT CONSTRUCTION STANDARDS, LATEST EDITION
2. SUBGRADE SHALL BE FREE OF ALL ROCKS AND DEBRIS LARGER THAN 1" DIAMETER. CERTIFIED COMPACTION TESTS MUST BE SUBMITTED TO ENGINEER PRIOR TO APPLICATION OF BASE MATERIAL.
3. SUBGRADE SHALL BE GRADED AND SLOPED TOWARD DRAINAGE STURCTURES AND SITCHED TO PREVENT THE ENTRAPMENT OF WATER WITHIN BASE MATERIAL. SUBGRADE SHALL BE INSPECTED AND APPROVED BY OWNERS REPRESENTIVE PRIOR TO THE INSTALLATION OF BASE.
4. CONCRETE SHALL HAVE THE FOLLOWING 28 DAY MINIMUM

CONCRETE PAVEMENT SECTION NOT TO SCALE



Pavement Detail

Finklea Fire Station No. 6
Green Sea, Horry County, South Carolina

SCALE:
AS SHOWN
DATE:
5/8/24
PROJECT NUMBER
23630075A

FIGURE NO.

5



Appendix II – Field Exploration Procedures and Data



◆ Summary of Exploration Procedures

The American Society for Testing and Materials (ASTM) publishes standard methods to explore soil, rock and ground water conditions in Practice D-420-18, "*Standard Guide for Site Characterization for Engineering Design and Construction Purposes*." The boring and sampling plan must consider the geologic or topographic setting. It must consider the proposed construction. It must also allow for the background, training, and experience of the geotechnical engineer. While the scope and extent of the exploration may vary with the objectives of the client, each exploration includes the following key tasks:

- Reconnaissance of the Project Area
- Preparation of Exploration Plan
- Layout and Access to Field Sampling Locations
- Field Sampling and Testing of Earth Materials
- Laboratory Evaluation of Recovered Field Samples
- Evaluation of Subsurface Conditions

The standard methods do not apply to all conditions or to every site. Nor do they replace education and experience, which together make up engineering judgment. Finally, ASTM D 420 does not apply to environmental investigations.

◆ Reconnaissance of the Project Area

We walked over the site to note land use, topography, ground cover, and surface drainage. We observed general access to proposed sampling points and noted any existing structures.

Checks for Hazardous Conditions - State law requires that we notify SC-811 before we drill or excavate at any site. SC-811 is operated by the major water, sewer, electrical, telephone, CATV, and natural gas suppliers of South Carolina. SC-811 forwarded our location request to the participating utilities. Location crews then marked buried lines with colored flags within 72 hours. They did not mark utility lines beyond junction boxes or meters. We checked proposed sampling points for conflicts with marked utilities, overhead power lines, tree limbs, or man-made structures during the site walkover.

◆ Boring and Sampling

Electronic Cone Penetrometer (CPT) Soundings

CPT soundings consist of a conical pointed penetrometer which is hydraulically pushed into the soil at a slow, measured rate. Procedures for measurement of the tip resistance and side friction resistance to push generally follow those described by ASTM D-5778, "*Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils*."

A penetrometer with a conical tip having a 60 degree apex angle and a cone base area of 10 cm² was advanced into the soil at a constant rate of 20 mm/s. The force on the conical point required to penetrate the soil was measured electronically every 50 mm penetration to obtain the *cone resistance* q_c . A friction sleeve is present on the penetrometer immediately behind the cone tip. The force exerted on the sleeve was measured electronically at a minimum of every 50 mm penetration and divided by the surface area of the sleeve to obtain the *friction*

Summary of Exploration Procedures - Continued



sleeve resistance value f_s . A pore pressure element mounted immediately behind the cone tip was used to measure the pore pressure induced during advancement of the cone into the soil.

CPT Soil Stratification

Using ASTM D-5778 soil samples are not obtained. Soil classification was made on the basis of comparison of the tip resistance, sleeve resistance and pore pressure values to values measured at other locations in known soil types, using experience with similar soils and exercising engineering judgment.

Plots of normalized tip resistance versus friction ratio and normalized tip resistance versus penetration pore pressure were used to determine soil classification (Soil Behavior Type, SBT) as a function of depth using empirical charts developed by P.K. Robertson (1990). The friction ratio soil classification is determined from the chart in the appendix using the normalized corrected tip stress and the normalized corrected tip stress and the normalized friction ratio.

At some depths, the CPT data fell outside of the range of the classification chart. When this occurred, no data was plotted and a break was shown in the classification profile. This occasionally occurred at the top of a penetration as the effective vertical stress is very small and commonly produced normalized tip resistances greater than 1000.

To provide a simplified soil stratigraphy for general interpretation and for comparison to standard boring logs, a statistical layering and classification system was applied the field classification values. Layer thicknesses were determined based on the variability of the soil classification profile, based upon changes in the standard deviation of the SBT classification number with depth. The average SBT number was determined for each successive 6-inch layer, beginning at the surface. Whenever an additional 6-inch increment deviated from the previous increment, a new layer was started, otherwise, this material was added to the layer above and the next 6-inch section evaluated. The soil behavior type for the layer was determined by the mean value for the complete layer.

Downhole Shear Wave Velocity Test

Shear wave velocity measurements were performed using a cone penetrometer equipped with geophones, or a seismic cone penetrometer (SCPT). The seismic cone penetrometer measures the travel times of surface generated vibrations to geophones mounted on the penetrometer at various incremental depths in the sounding. At a given depth, the travel time of the first arrival is measured and corrected for the horizontal offset of the source at the surface from the sounding. Interval velocities are calculated by dividing the difference in travel times by the vertical distance between successive measurement depths. Measurements were made at 1 meter intervals – the length of commonly available CPT extension rods – unless otherwise noted.

Hand Auger Borings with Dynamic Cone Penetrometer

Auger borings were advanced using hand operated augers. The soils encountered were identified in the field by cuttings brought to the surface. Representative samples of the cuttings were placed in glass jars or plastic bags and later transported to the laboratory. Soil consistency was qualitatively estimated by the relative difficulty of advancing the augers. At 1 foot intervals, the augers were withdrawn and soil consistency was measured with a dynamic cone penetrometer. The conical point of the penetrometer was first seated 1-3/4 inches to penetrate any loose cuttings in the boring, then driven two additional 1-3/4 inch increments by a 15 pound hammer falling 20 inches. The number of hammer blows required to achieve this penetration was recorded. When properly evaluated by qualified professional staff, the blow count is an index to the soil strength and ability to support foundations.

Summary of Exploration Procedures - Continued



Hand Auger Borings without Dynamic Cone Penetrometer

Auger borings were advanced using hand operated augers. The soils encountered were identified in the field by cuttings brought to the surface. Representative samples of the cuttings were placed in glass jars or plastic bags and later transported to the laboratory. Soil consistency was qualitatively estimated by the relative difficulty of advancing the augers.

Water Level Measurement

Subsurface water levels in each sounding were measured via pore water pressure readings and corresponding depths from the existing grade. Subsurface water was measured from existing ground surface at the end of the drilling day in the hand auger borings using a tape measure, where encountered.

Backfilling of Borings

Once subsurface water levels were obtained, boring spoils were backfilled into the open bore holes. Bore holes were backfilled to the existing ground surface.



Important Information About Your Geotechnical Engineering Report

Variations in subsurface conditions can be a principal cause of construction delays, cost overruns and claims. The following information is provided to assist you in understanding and managing the risk of these variations.

Geotechnical Findings Are Professional Opinions

Geotechnical engineers cannot specify material properties as other design engineers do. Geotechnical material properties have a far broader range on a given site than any manufactured construction material, and some geotechnical material properties may change over time because of exposure to air and water, or human activity.

Site exploration identifies subsurface conditions at the time of exploration and only at the points where subsurface tests are performed or samples obtained. Geotechnical engineers review field and laboratory data and then apply their judgment to render professional opinions about site subsurface conditions. Their recommendations rely upon these professional opinions. Variations in the vertical and lateral extent of subsurface materials may be encountered during construction that significantly impact construction schedules, methods and material volumes. While higher levels of subsurface exploration can mitigate the risk of encountering unanticipated subsurface conditions, no level of subsurface exploration can eliminate this risk.

Scope of Geotechnical Services

Professional geotechnical engineering judgment is required to develop a geotechnical exploration scope to obtain information necessary to support design and construction. A number of unique project factors are considered in developing the scope of geotechnical services, such as the exploration objective; the location, type, size and weight of the proposed structure; proposed site grades and improvements; the construction schedule and sequence; and the site geology.

Geotechnical engineers apply their experience with construction methods, subsurface conditions and exploration methods to develop the exploration scope. The scope of each exploration is unique based on available project and site information. Incomplete project information or constraints on the scope of exploration increases the risk of variations in subsurface conditions not being identified and addressed in the geotechnical report.

Services Are Performed for Specific Projects

Because the scope of each geotechnical exploration is unique, each geotechnical report is unique. Subsurface conditions are explored and recommendations are made for a specific project.

Subsurface information and recommendations may not be adequate for other uses. Changes in a proposed structure location, foundation loads, grades, schedule, etc. may require additional geotechnical exploration, analyses, and consultation. The geotechnical engineer should be consulted to determine if additional services are required in response to changes in proposed construction, location, loads, grades, schedule, etc.

Geo-Environmental Issues

The equipment, techniques, and personnel used to perform a geo-environmental study differ significantly from those used for a geotechnical exploration. Indications of environmental contamination may be encountered incidental to performance of a geotechnical exploration but go unrecognized. Determination of the presence, type or extent of environmental contamination is beyond the scope of a geotechnical exploration.

Geotechnical Recommendations Are Not Final

Recommendations are developed based on the geotechnical engineer's understanding of the proposed construction and professional opinion of site subsurface conditions. Observations and tests must be performed during construction to confirm subsurface conditions exposed by construction excavations are consistent with those assumed in development of recommendations. It is advisable to retain the geotechnical engineer that performed the exploration and developed the geotechnical recommendations to conduct tests and observations during construction. This may reduce the risk that variations in subsurface conditions will not be addressed as recommended in the geotechnical report.

CPT Soil Classification Legend

Zone	Q_t/N	Description
1		2 Sensitive, Fine Grained
2		1 Organic Soils-Peats
3		1.5 Clays-Clay to Silty Clay
4		2 Silt Mixtures-Clayey Silt to Silty Clay
5		3 Sand Mixtures-Silty Sand to Sandy Silt
6		4.5 Sands-Clean Sand to Silty Sand
7		6 Gravelly Sand to Sand
8		1 Very Stiff Clay to Clayey Sand*
9		2 Very Stiff, Fine Grained*

(*) Heavily Overconsolidated or Cemented

Robertson's Soil Behavior Type (SBT), 1990			
Group #	Description	Ic	
		Min	Max
1	Sensitive, fine grained	N/A	
2	Organic soils - peats	3.60	N/A
3	Clays - silty clay to clay	2.95	3.60
4	Silt mixtures - clayey silt to silty clay	2.60	2.95
5	Sand mixtures - silty sand to sandy silt	2.05	2.60
6	Sands - clean sand to silty sand	1.31	2.05
7	Gravelly sand to dense sand	N/A	1.31
8	Very stiff sand to clayey sand (High OCR or cemented)	N/A	
9	Very stiff, fine grained (High OCR or cemented)	N/A	

Soil behavior type is based on empirical data and may not be representative of soil classification based on plasticity and grain size distribution.

Relative Density and Consistency Table			
SANDS		SILTS and CLAYS	
Cone Tip Stress, q_t (tsf)	Relative Density	Cone Tip Stress, q_t (tsf)	Consistency
Less than 20	Very Loose	Less than 5	Very Soft
20 - 40	Loose	5 - 15	Soft to Firm
40 - 120	Medium Dense	15 - 30	Stiff
120 - 200	Dense	30 - 60	Very Stiff
Greater than 200	Very Dense	Greater than 60	Hard

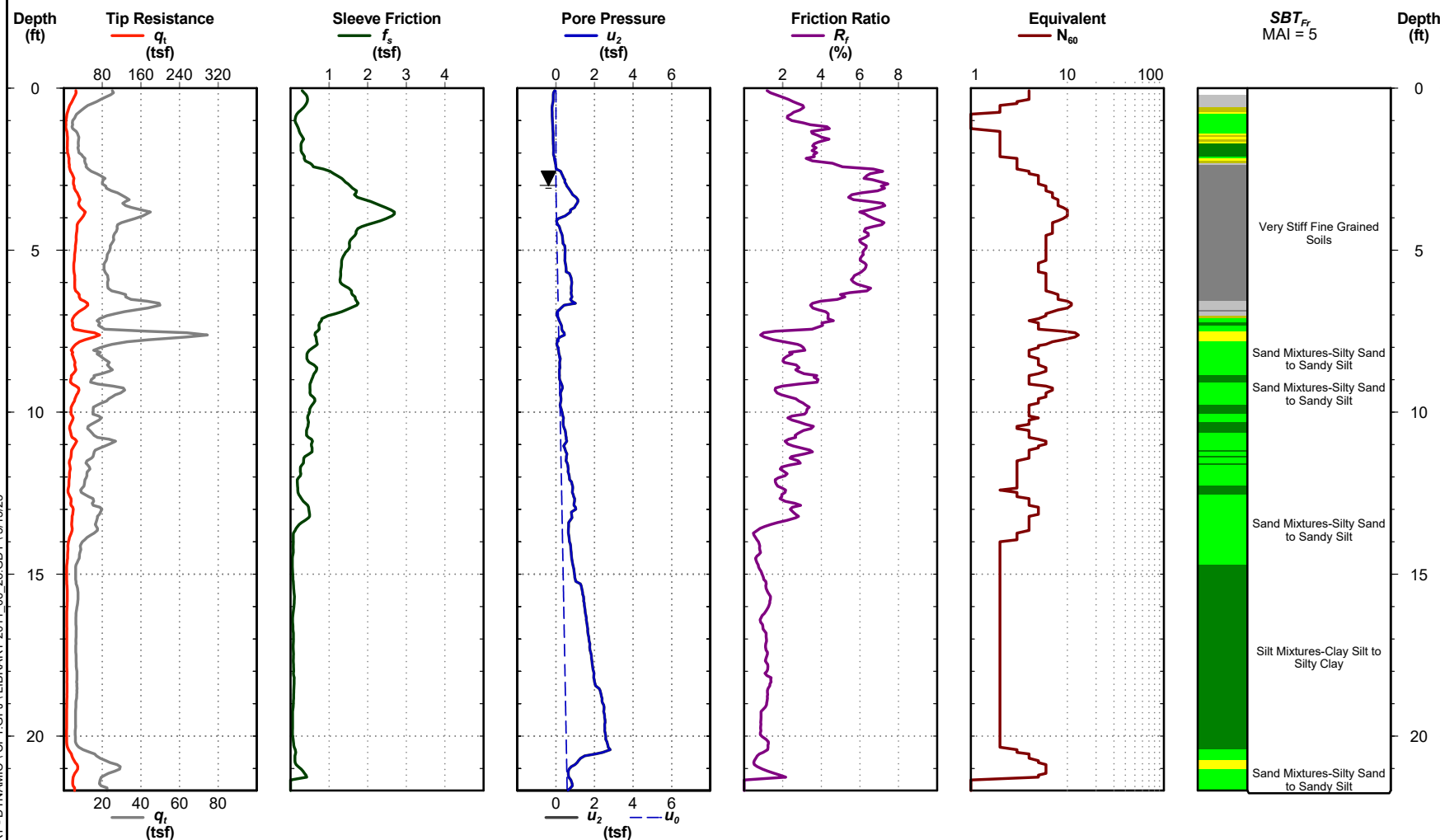


Finklea Tract
Green Sea, South Carolina
S&ME Project No: 23630075

Sounding ID: C-1

Date: Apr. 28, 2023
Estimated Water Depth: 3 ft
Rig/Operator: Marooka/P. Saner

Total Depth: 21.7 ft
Termination Criteria: Target Depth
Cone Size: 1.75



Cone Penetration Test

Electronic Filename: C-01.ecp

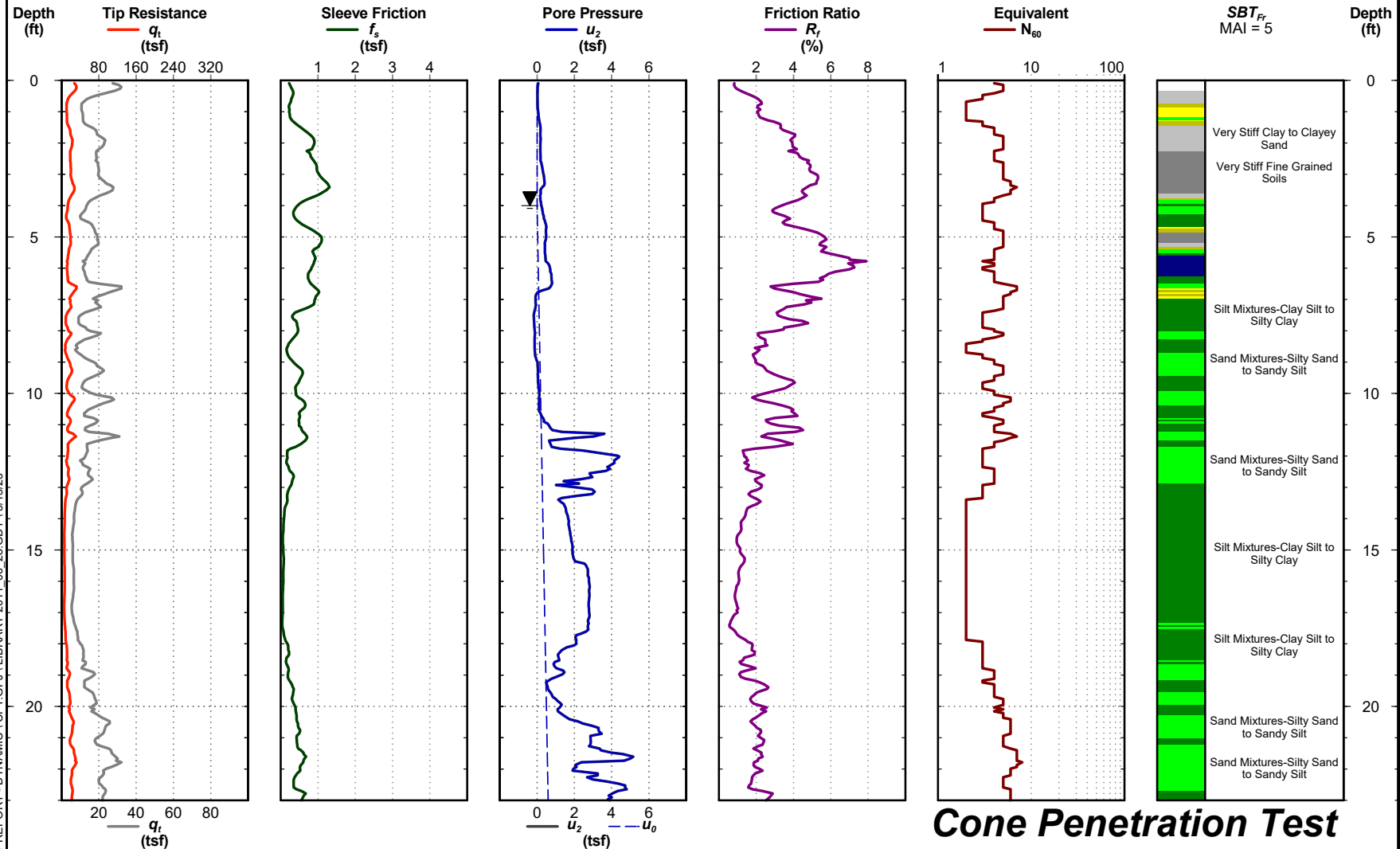


Finklea Tract
Green Sea, South Carolina
S&ME Project No: 23630075

Sounding ID: C-2

Date: Apr. 28, 2023
Estimated Water Depth: 4 ft
Rig/Operator: Marooka/P. Saner

Total Depth: 40.8 ft
Termination Criteria: Target Depth
Cone Size: 1.75



CPT REPORT - DYNAMIC \ CPT.GPJ \ LIBRARY 2011_06_28.GDT \ 5/15/23

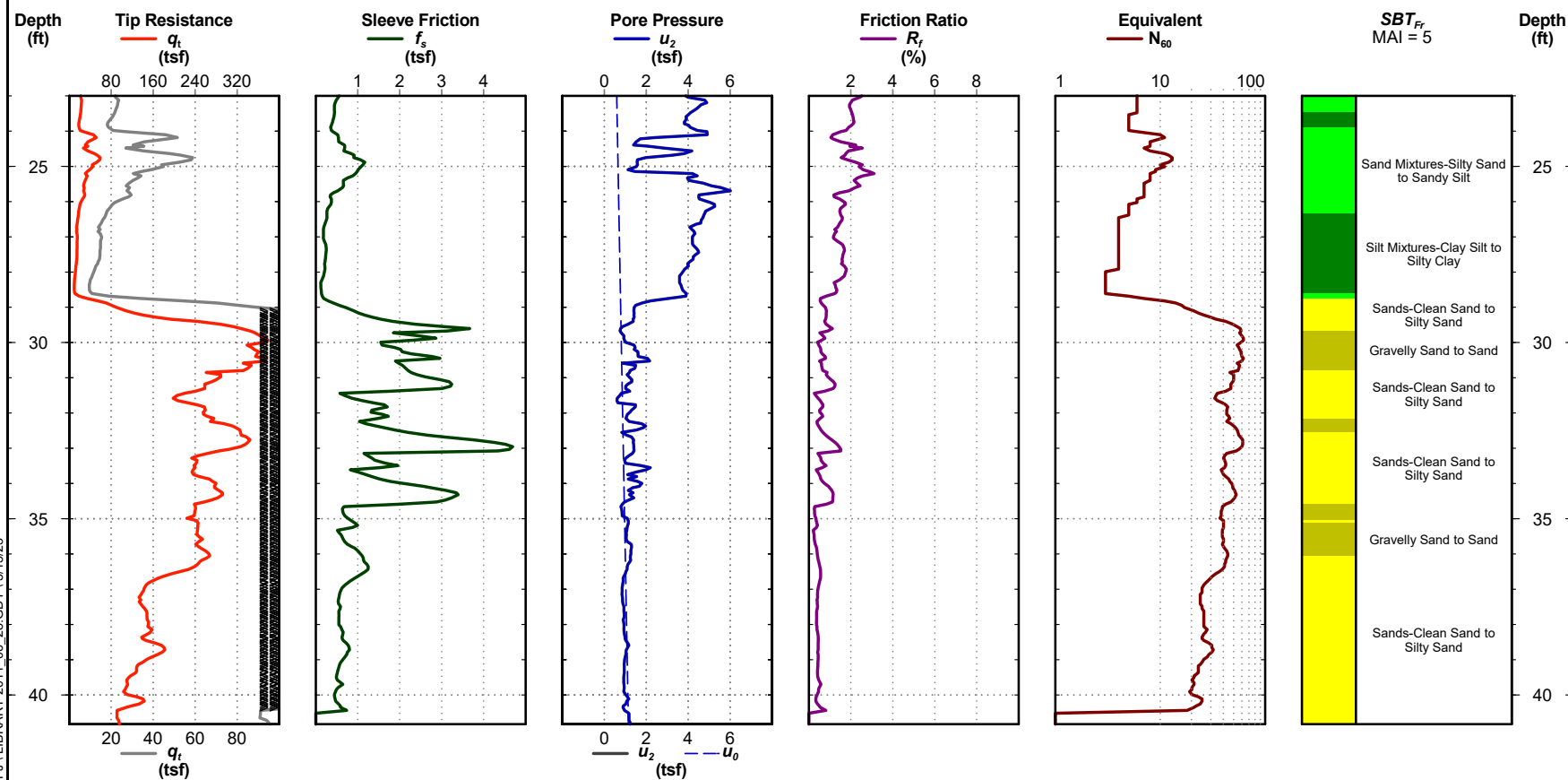


Finklea Tract
Green Sea, South Carolina
S&ME Project No: 23630075

Sounding ID: C-2

Date: Apr. 28, 2023
Estimated Water Depth: 4 ft
Rig/Operator: Marooka/P. Saner

Total Depth: 40.8 ft
Termination Criteria: Target Depth
Cone Size: 1.75



Cone Penetration Test

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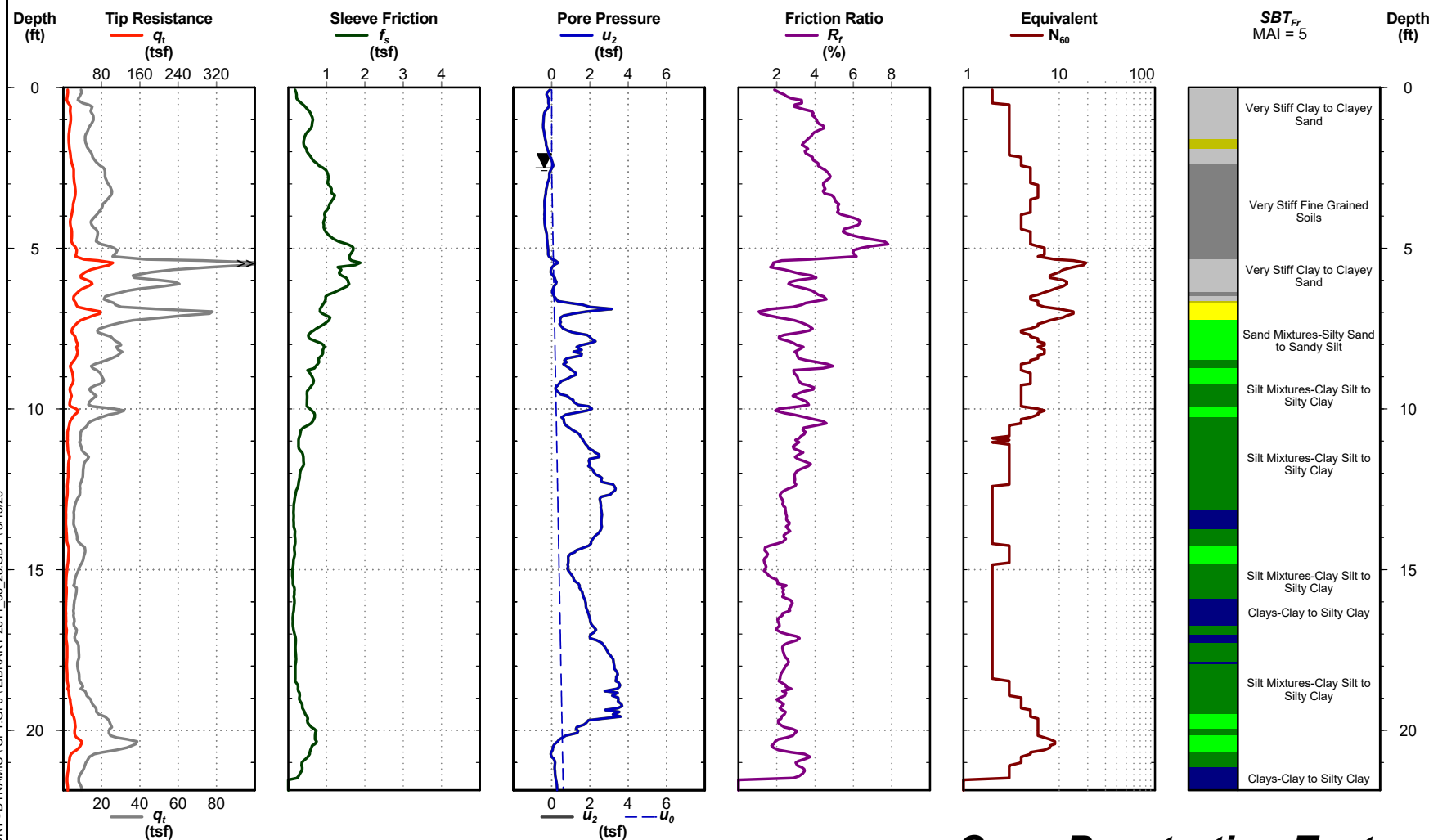


Finklea Tract
Green Sea, South Carolina
S&ME Project No: 23630075

Sounding ID: C-3

Date: Apr. 28, 2023
Estimated Water Depth: 2.5 ft
Rig/Operator: Marooka/P. Saner

Total Depth: 21.9 ft
Termination Criteria: Target Depth
Cone Size: 1.75



Cone Penetration Test

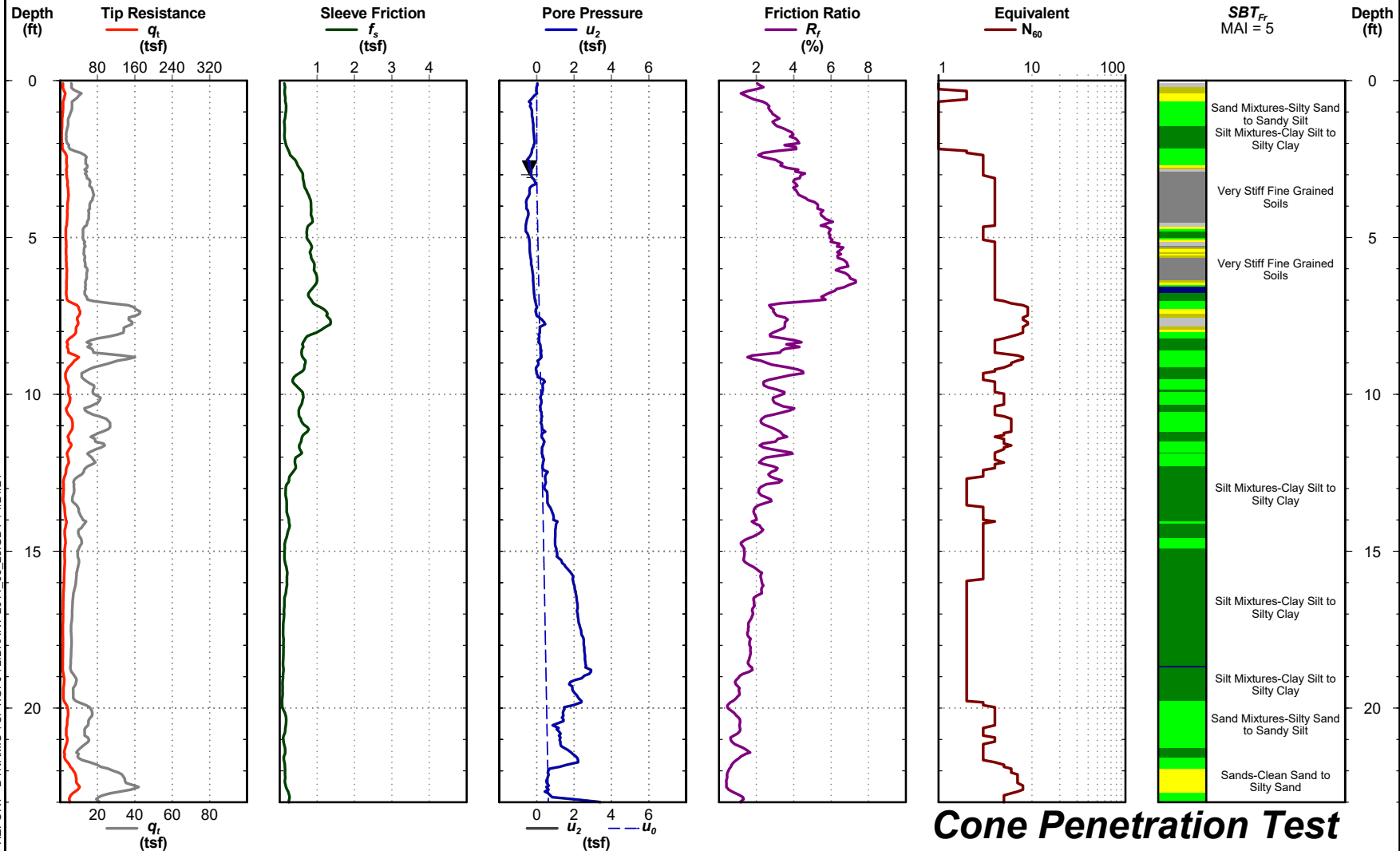
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Finklea Fire Station No. 6
Green Sea, Horry County, South Carolina
S&ME Project No: 23630075A

Date: Apr. 23, 2024
Estimated Water Depth: 3 ft
Rig/Operator: Marooka/B. Jones

Sounding ID: C-4
Total Depth: 32.4 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



CPT REPORT - DYNAMIC \ CPT.GPJ \ LIBRARY 2011_06_28.GDT \ 4/24/24

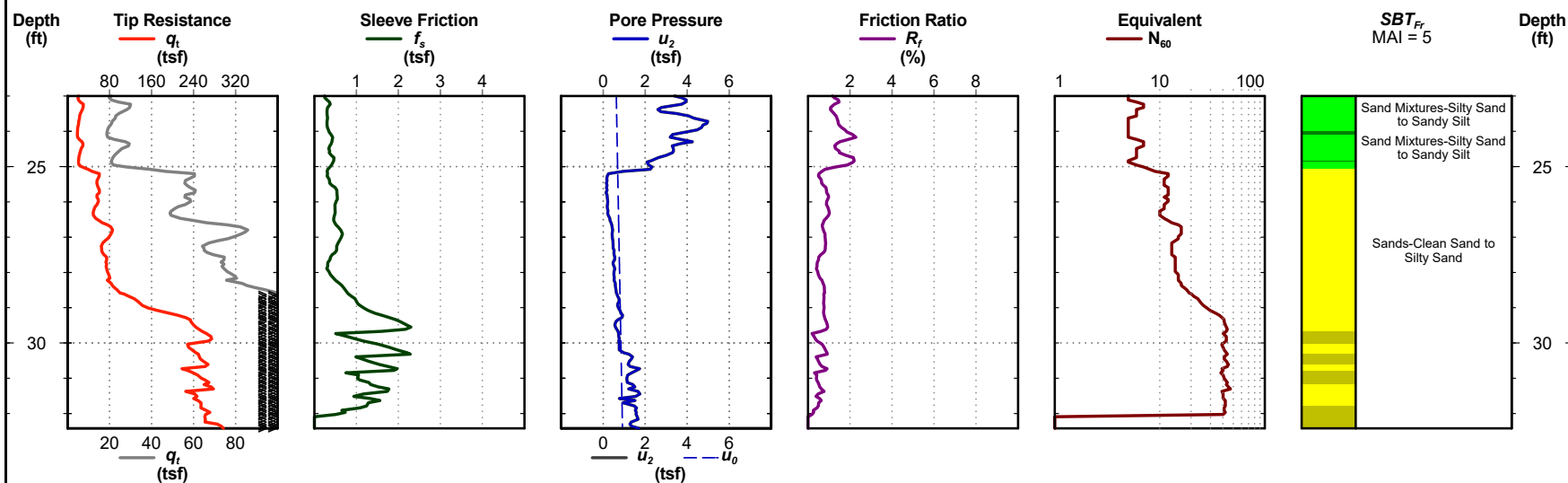


Finklea Fire Station No. 6
Green Sea, Horry County, South Carolina
S&ME Project No: 23630075A

Sounding ID: C-4

Date: Apr. 23, 2024
Estimated Water Depth: 3 ft
Rig/Operator: Marooka/B. Jones

Total Depth: 32.4 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



Cone Penetration Test

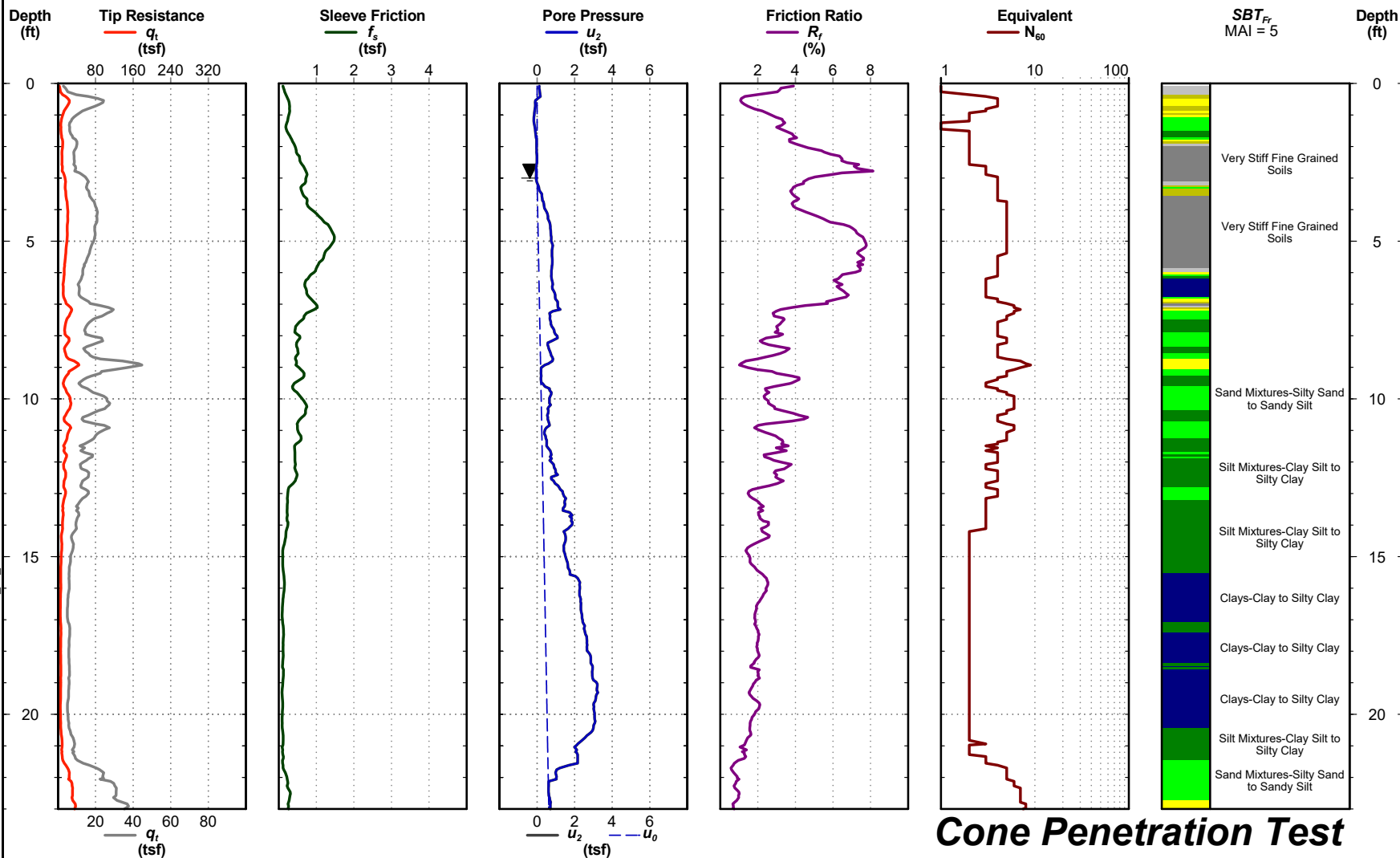
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Finklea Fire Station No. 6
Green Sea, Horry County, South Carolina
S&ME Project No: 23630075A

Date: Apr. 23, 2024
Estimated Water Depth: 3 ft
Rig/Operator: Marooka/B. Jones

Sounding ID: C-5
Total Depth: 43.4 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



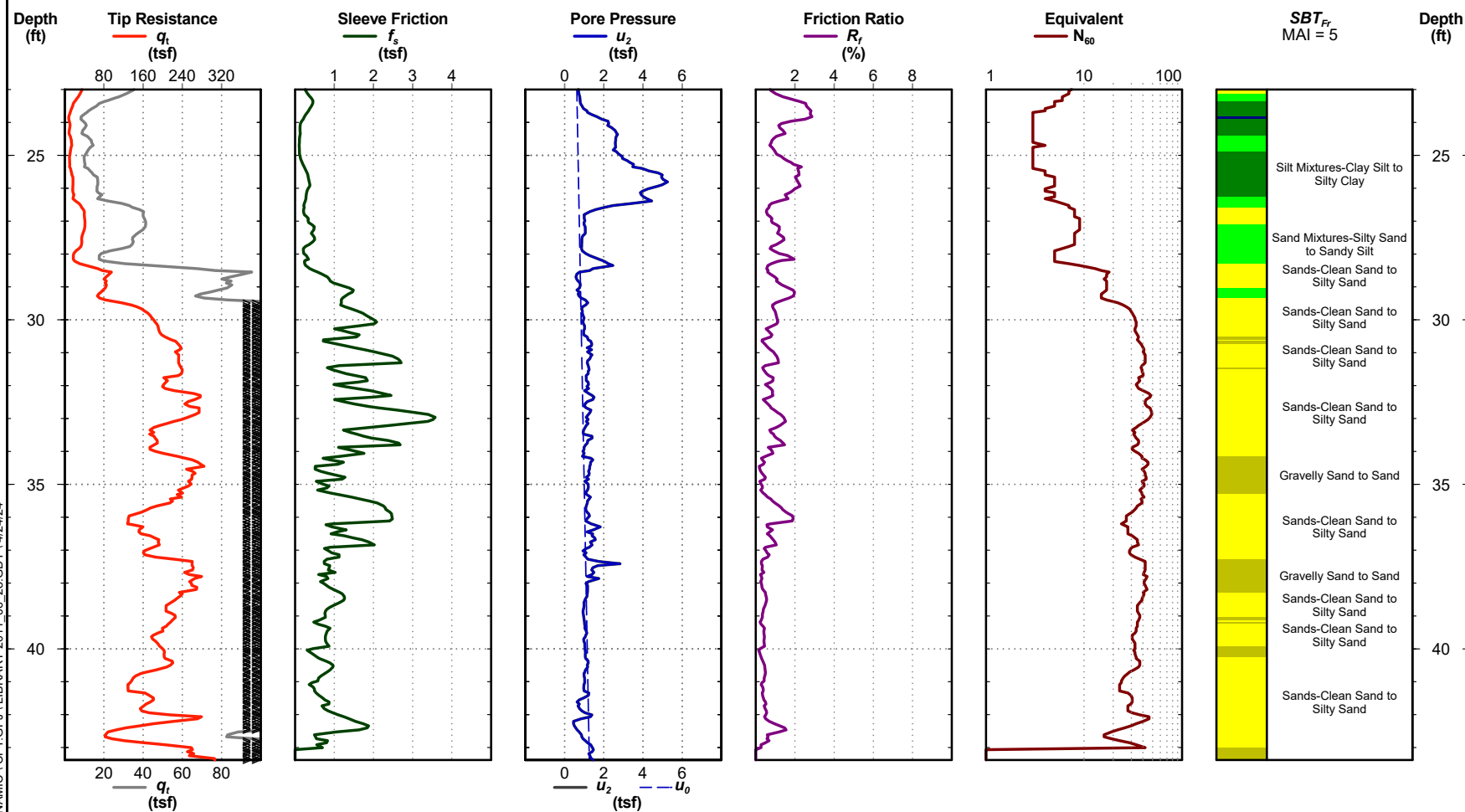
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Finklea Fire Station No. 6
Green Sea, Horry County, South Carolina
S&ME Project No: 23630075A

Date: Apr. 23, 2024
Estimated Water Depth: 3 ft
Rig/Operator: Marooka/B. Jones

Sounding ID: C-5
Total Depth: 43.4 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



Cone Penetration Test

Electronic Filename: C-05.ecp

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS



PROJECT: Finklea Tract Loris, South Carolina 23630075		HAND AUGER BORING LOG: C-1	
DATE STARTED: 4/12/23		DATE FINISHED: 4/12/23	
SAMPLING METHOD: Grab Sample		PERFORMED BY: J. Lighthall	
WATER LEVEL: 15" At end of drilling day. (Perched)		NOTES: Elevation unknown.	

Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
		<u>PLOWZONE</u> - CLAYEY SAND (SC) - Mostly fine sand, some low to medium plasticity fines, trace organics, brown, moist.		
1		FAT CLAY (CH) - Mostly medium plasticity fines, trace fine sand, light yellowish brown and orange, wet.		▽
2		--- Orange, light gray, and red, moist.		
3				
4		Boring terminated at 4 ft		



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: Finklea Tract Loris, South Carolina 23630075		HAND AUGER BORING LOG: C-2	
DATE STARTED: 4/12/23		DATE FINISHED: 4/12/23	
SAMPLING METHOD: Grab Sample		PERFORMED BY: J. Lighthall	
WATER LEVEL: 27" TOB. (Perched)		NOTES: Elevation unknown.	

Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
1		<u>PLOWZONE</u> - CLAYEY SAND (SC) - Mostly fine sand, some low to medium plasticity fines, trace organics, gray, moist.		-
2		FAT CLAY (CH) - Mostly medium plasticity fines, trace fine sand, trace organics, gray, wet. - - - - Yellow, red, and gray, moist.		-
3				-
4		Boring terminated at 4 ft		-



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: Finklea Tract Loris, South Carolina 23630075		HAND AUGER BORING LOG: C-3	
DATE STARTED: 4/12/23		DATE FINISHED: 4/12/23	
SAMPLING METHOD: Grab Sample		PERFORMED BY: J. Lighthall	
WATER LEVEL: 17" At end of drilling day. (Perched)		NOTES: Elevation unknown.	

Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
		<u>PLOWZONE</u> - CLAYEY SAND (SC) - Mostly fine sand, some low to medium plasticity fines, trace organics, brown, moist.		
1		FAT CLAY (CH) - Mostly medium plasticity fines, trace fine sand, light yellowish brown and orange, wet. ---- Yellowish brown and red. ---- Gray, yellow, and red, moist.		-  - -
2				
3				
4		Boring terminated at 4 ft		



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

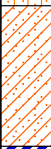
PROJECT: Finklea Fire Station No. 6 Green Sea, Horry County, South Carolina 23630075A		HAND AUGER BORING LOG: C-4	
DATE STARTED: 4/12/23		DATE FINISHED: 4/12/23	
SAMPLING METHOD: Hand Auger		PERFORMED BY: R. Yeoman	
WATER LEVEL: Not Encountered TOB.		NOTES: Elevation Unknown	

Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
		<u>PLOWZONE - SILTY SAND (SM)</u> - Mostly fine to medium sand, some low plasticity fines, trace organics, brown, moist.		
1		CLAYEY SAND (SC) - Mostly fine to medium sand, some low to medium plasticity fines, brown and orange, moist. - - - - Brown, gray, orange, and red.		-
2		- - - - Brown, white, orange, and red.		-
3				-
4		Boring terminated at 4 ft		



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: Finklea Fire Station No. 6 Green Sea, Horry County, South Carolina 23630075A		HAND AUGER BORING LOG: C-5	
DATE STARTED: 4/12/23		DATE FINISHED: 4/12/23	
SAMPLING METHOD: Hand Auger		PERFORMED BY: R. Yeoman	
WATER LEVEL: 23" TOB.		NOTES: Elevation Unknown	

Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
		<u>PLOWZONE - SILTY SAND (SM)</u> - Mostly fine to medium sand, some low plasticity fines, trace organics, dark gray, moist.		
1		CLAYEY SAND (SC) - Mostly fine to medium sand, some low to medium plasticity fines, brown and gray, moist.		-
2		SANDY FAT CLAY (CH) - Mostly medium to high plasticity fines, some fine to medium sands, brown, and orange, wet. - - - - Brown, light gray, orange, and red.		▽ -
3				-
4		Boring terminated at 4 ft		



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: Finklea Tract Loris, South Carolina 23630075				HAND AUGER BORING LOG: HA-1			
DATE STARTED: 4/12/23		DATE FINISHED: 4/12/23		NOTES: Elevation unknown.			
SAMPLING METHOD: Grab Sample		PERFORMED BY: J. Lighthall					
WATER LEVEL: 18" At end of drilling day. (Perched)							
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE	
					1020306080		
1		PLOWZONE - CLAYEY SAND (SC) - Mostly fine sand, some low to medium plasticity fines, trace organics, brown, moist, loose.		-		5	
2		FAT CLAY (CH) - Mostly medium plasticity fines, trace fine sand, light yellowish brown and orange, wet, firm. - - - Yellow, red, and gray, moist.				6	
3		- - - Stiff.		-		10	
4		Boring terminated at 4 ft				14	



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: Finklea Tract Loris, South Carolina 23630075				HAND AUGER BORING LOG: HA-2			
DATE STARTED: 4/12/23		DATE FINISHED: 4/12/23		NOTES: Elevation unknown.			
SAMPLING METHOD: Grab Sample		PERFORMED BY: J. Lighthall					
WATER LEVEL: 17" At end of drilling day. (Perched)							
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE	
					1020306080		
1		PLOWZONE - CLAYEY SAND (SC) - Mostly fine sand, some low to medium plasticity fines, trace organics, brown, moist, very loose.					
2		FAT CLAY (CH) - Mostly medium plasticity fines, trace fine sand, light yellowish brown and orange, wet, firm.				5	
3		---- Orange, red, and gray, moist. ---- Stiff.				5	
4		Boring terminated at 4 ft				12	
						11	



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: Finklea Tract Loris, South Carolina 23630075				HAND AUGER BORING LOG: HA-3			
DATE STARTED: 4/12/23		DATE FINISHED: 4/12/23		NOTES: Elevation unknown.			
SAMPLING METHOD: Grab Sample		PERFORMED BY: J. Lighthall					
WATER LEVEL: 8" At end of drilling day. (Perched)							
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE	
					1020306080		
1		PLOWZONE - SILTY SAND (SM) - Mostly fine sand, some low to medium plasticity fines, trace organics, gray, moist, loose.		▽			
2		SANDY FAT CLAY (CH) - Mostly medium plasticity fines, some fine sand, gray, orange, and red, wet, firm. ---- Soft.		-	●	5	
3		---- Firm.		-	●	3	
4		Boring terminated at 4 ft		-	●	5	
						7	



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: Finklea Fire Station No. 6 Green Sea, Horry County, South Carolina 23630075A				HAND AUGER BORING LOG: HA-4			
DATE STARTED: 4/12/23		DATE FINISHED: 4/12/23		NOTES: Elevation Unknown			
SAMPLING METHOD: Hand Auger		PERFORMED BY: R. Yeoman					
WATER LEVEL: 37" TOB.							
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE	
					1020306080		
		PLOWZONE - SILTY SAND (SM) - Mostly fine to medium sand, some low plasticity fines, trace organics, brown and orange, moist, very loose.					
1		CLAYEY SAND (SC) - Mostly fine to medium sand, some low to medium plasticity fines, brown, orange, and light gray, moist, very loose. - - - Brown, orange, light gray, and red, wet, loose.	-	-		2	
2			-	-		5	
3			-			6	
4		Boring terminated at 4 ft				7	



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: Finklea Fire Station No. 6 Green Sea, Horry County, South Carolina 23630075A				HAND AUGER BORING LOG: HA-5			
DATE STARTED: 4/12/23		DATE FINISHED: 4/12/23		NOTES: Elevation Unknown			
SAMPLING METHOD: Hand Auger		PERFORMED BY: R. Yeoman					
WATER LEVEL: 22" TOB.							
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE	
					1020306080		
		<u>PLOWZONE - SILTY SAND (SM)</u> - Mostly fine to medium sand, some low plasticity fines, trace organics, brown, moist, very loose.					
1		CLAYEY SAND (SC) - Mostly fine to medium sand, some low to medium plasticity fines, brown and orange, moist, very loose.				2	
2		SANDY FAT CLAY (CH) - Mostly medium to high plasticity fines, some fine sands, brown, orange, gray, and red, wet, very soft. ---- Weight of Hammer at 2 feet.		▽		WOH	
3		---- Soft.				3	
4		Boring terminated at 4 ft				3	



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: Finklea Fire Station No. 6 Green Sea, Horry County, South Carolina 23630075A				HAND AUGER BORING LOG: HA-6			
DATE STARTED: 4/12/23		DATE FINISHED: 4/12/23		NOTES: Elevation Unknown			
SAMPLING METHOD: Hand Auger		PERFORMED BY: R. Yeoman					
WATER LEVEL: 41" TOB.							
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE	
					1020306080		
		<u>PLOWZONE - SILTY SAND (SM)</u> - Mostly fine to medium sand, some low plasticity fines, brown, moist, very loose.					
1		CLAYEY SAND (SC) - Mostly fine to medium sand, some low to medium plasticity fines, brown, and orange, moist, very loose. - - - - Brown, white, orange, and red.	-	-	●	3	
2		- - - - Loose.	-	-	●	6	
3		- - - - Wet, medium dense.	-	-	●	11	
4		- - - - Loose. Boring terminated at 4 ft		▽	●	7	



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: Finklea Fire Station No. 6 Green Sea, Horry County, South Carolina 23630075A				HAND AUGER BORING LOG: HA-7			
DATE STARTED: 4/12/23		DATE FINISHED: 4/12/23		NOTES: Elevation Unknown			
SAMPLING METHOD: Hand Auger		PERFORMED BY: R. Yeoman					
WATER LEVEL: 31" TOB.							
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE	
					1020306080		
1		PLOWZONE - CLAYEY SAND (SC) - Mostly fine to medium sand, some low to medium plasticity fines, trace organics, brown, moist, very loose.					
		CLAYEY SAND (SC) - Mostly fine to medium sand, some low to medium plasticity fines, brown, light gray, orange, and red, moist, very loose.		-		4	
2		SANDY FAT CLAY (CH) - Mostly medium to high plasticity fines, some fine to medium sand, brown, orange, light gray, and red, wet, soft.		-		3	
3		---- Firm.		▽		5	
4		Boring terminated at 4 ft				6	



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

Appendix III – Laboratory Test Procedures and Results



◆ Summary of Laboratory Procedures

Examination of Recovered Soil Samples

Soil and field records were reviewed in the laboratory by the geotechnical professional. Soils were classified in general accordance with the visual-manual method described in ASTM D 2488, "*Standard Practice for Description and Identification of Soils (Visual-Manual Method)*". Representative soil samples were selected for classification testing to provide grain size and plasticity data to allow classification of the samples in general accordance with the Unified Soil Classification System method described in ASTM D 2487, "*Standard Practice for Classification of Soils for Engineering Purposes*". The geotechnical professional also prepared the final boring and sounding records enclosed with this report.

Moisture Content Testing of Soil Samples by Oven Drying

Moisture content was determined in general conformance with the methods outlined in ASTM D 2216, "*Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil or Rock by Mass*." This method is limited in scope to Group B, C, or D samples of earth materials which do not contain appreciable amounts of organic material, soluble solids such as salt or reactive solids such as cement. This method is also limited to samples which do not contain contamination.

A representative portion of the soil was divided from the sample using one of the methods described in Section 9 of ASTM D 2216. The split portion was then placed in a drying oven and heated to approximately 110 degrees C overnight or until a constant mass was achieved after repetitive weighing. The moisture content of the soil was then computed as the mass of water removed from the sample by drying, divided by the mass of the sample dry, times 100 percent. No attempt was made to exclude any particular particle size from the portion split from the sample.

Percent Fines Determination of Samples

A selected specimen of soils was washed over a No. 200 sieve after being thoroughly mixed and dried. This test was conducted in general accordance with ASTM D 1140, "*Standard Test Method for Amount of Material Finer Than the No. 200 Sieve*." Method B, using a hexametaphosphate solution to pre-soak the specimen for at least 2 hours, was used to prepare the sample. The sample is then washed through the No. 200 sieve the percentage by weight of material washed through the sieve was deemed the "percent fines" or percent clay and silt fraction.

Liquid and Plastic Limits Testing

Atterberg limits of the soils was determined generally following the methods described by ASTM D 4318, "*Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils*." Albert Atterberg originally defined "limits of consistency" of fine grained soils in terms of their relative ease of deformation at various moisture contents. In current engineering usage, the *liquid limit* of a soil is defined as the moisture content, in percent, marking the upper limit of viscous flow and the boundary with a semi-liquid state. The *plastic limit* defines the lower limit of plastic behavior, above which a soil behaves plastically below which it retains its shape upon drying. The *plasticity index* (PI) is the range of water content over which a soil behaves plastically. Numerically, the PI is the difference between liquid limit and plastic limit values.

Representative portions of fine grained Group A, B, C, or D samples were prepared using the wet method described in Section 10.1 of ASTM D 4318. The liquid limit of each sample was determined using the multipoint

Summary of Laboratory Procedures - Continued



method (Method A) described in Section 11. The liquid limit is by definition the moisture content where 25 drops of a hand operated liquid limit device are required to close a standard width groove cut in a soil sample placed in the device. After each test, the moisture content of the sample was adjusted and the sample replaced in the device. The test was repeated to provide a minimum of three widely spaced combinations of N versus moisture content. When plotted on semi-log paper, the liquid limit moisture content was determined by straight line interpolation between the data points at N equals 25 blows.

The plastic limit was determined using the procedure described in Section 17 of ASTM D 4318. A selected portion of the soil used in the liquid limit test was kneaded and rolled by hand until it could no longer be rolled to a 3.2 mm thread on a glass plate. This procedure was repeated until at least 6 grams of material was accumulated, at which point the moisture content was determined using the methods described in ASTM D 2216.

Moisture-Density Relationship of Soils Using Standard Effort

Soil placed as engineering fill is compacted to a dense state to obtain satisfactory engineering properties. Laboratory moisture-density relationship tests provide the basis for determining the percent compaction and water content needed to achieve the required engineering properties, and for controlling construction to assure the required compaction and water contents are achieved. Test procedures generally followed those described by ASTM D 698, *"Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 lbf/ft³)."*

The relationship between water content and the dry unit weight is determined for soils compacted in either 4 or 6-inch diameter molds with a 5.5 lbf rammer dropped from a height of 12 inches, producing a compactive effort of 12,400 lbf/ft³. ASTM D 698 provides three alternative procedures depending on material gradation, designated as Methods A, B, and C. See the upper-center portion of the report form for the method selected for each sample.

Method A

- All material passes No. 4 sieve size
- 4-inch diameter mold
- Shall be used if 25 percent or less by weight is retained on No. 4 sieve
- Soil in 3 layers with 25 blows per layer

Method B

- All material passes 3/8-inch sieve
- 4-inch diameter mold
- Shall be used if 25 percent by weight, or less, is retained on the 3/8 Inch sieve.
- Soil in 3 layers with 25 blows per layer

Method C

- All material passes 3/4 inch sieve
- 6-inch diameter mold
- Shall be used if more than 30 percent by weight, or less, is retained on the 3/4-inch sieve
- Soil in 3 layers with 56 blows per layer

Soil is compacted in the mold in three layers of approximately equal thickness, each compacted with either 25 or 56 blows of the rammer. After compaction of the sample in the mold, the resulting dry density and moisture content is determined and the procedure repeated. Separate soils are used for each sample point, adjusting the moisture content of the soil as described in Section 10.2 (Moist Preparation Method). The procedure was repeated for a sufficient number of water content values (or "points") to allow the dry density vs. water content

Summary of Laboratory Procedures - Continued



values to be plotted and the *maximum dry density* and *optimum moisture content* to be determined from the resulting curvilinear relationship.

Laboratory California Bearing Ratio Tests of Compacted Samples

This method is used to evaluate the potential strength of subgrade, subbase, and base course material, including recycled materials, for use in road and airfield pavements. Laboratory CBR tests were run in general accordance with the procedures laid out in ASTM D 1883, "*Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.*" Specimens were prepared in standard molds using two different levels of compactive effort within plus or minus 0.5 percent of the optimum moisture content value. While embedded in the compaction mold, each sample was inundated for a minimum period of 96 hours to achieve saturation. During inundation the specimen was surcharged by a weight approximating the anticipated weight of the pavement and base course layers. After removing the sample from the soaking bath, the soil was then sheared by jacking a piston having a cross sectional area of 3 square inches into the end surface of the specimen. The piston was jacked 0.5 inches into the specimen at a constant rate of 0.05 inches per minute.

The CBR is defined as the load required to penetrate a material to a predetermined depth, compared to the load required to penetrate a standard sample of crushed stone to the same depth. The CBR value was usually based on the load ratio for a penetration of 0.10 inches, after correcting the load-deflection curves for surface irregularities or upward concavity. However, where the calculated CBR for a penetration of 0.20 inches was greater than the result obtained for a penetration of 0.10 inches, the test was repeated by reversing the specimen and shearing the opposite end surface. Where the second test indicated a greater CBR at 0.20 inches penetration, the CBR for 0.20 inches penetration was used.

Revision Date: 08/16/17

☐

9/27/23

Notes / Deviations / References

Date _____

Page 1 of 1

9

Sample Date(s): 4/25/2023

9/27/2022

Notes / Deviations / References

Date _____

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MATERIAL FINER THAN THE #200 SIEVE



ASTM D1140

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526

Project #:	23630075	Report Date:	5/5/2023

Project Name:	Finklea Tract	Test Date(s):	4/26/2023

Client Name: Horry County Maintenance

Client Address: 307 Smith Street, Conway, South Carolina 29526

Sample by: J. Lighthall

LAB# 750

Sample Dates: 4/25/2023

Method; **A** ☐ **B** ☒

Soaked	☒	Soak Time	2 Hrs

[illegible]

Balance ID.	33444	Calibration Date:	7/10/23	#200 Sieve	18775	Calibration Date:	4/5/2022

Notes / Deviations / References: ASTM D1140: Amount of Material in Soil Finer Than the No. 200 (75-um) Sieve

Jason S. McGough
Technician

Jason S. McGough
Signature

Lab Supervisor
Position

5/5/2023
Date

Ron Forest, P.E.
Technical Responsibility

RPJ
Signature

Principal Engineer
Position

5/5/2023
Date

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526

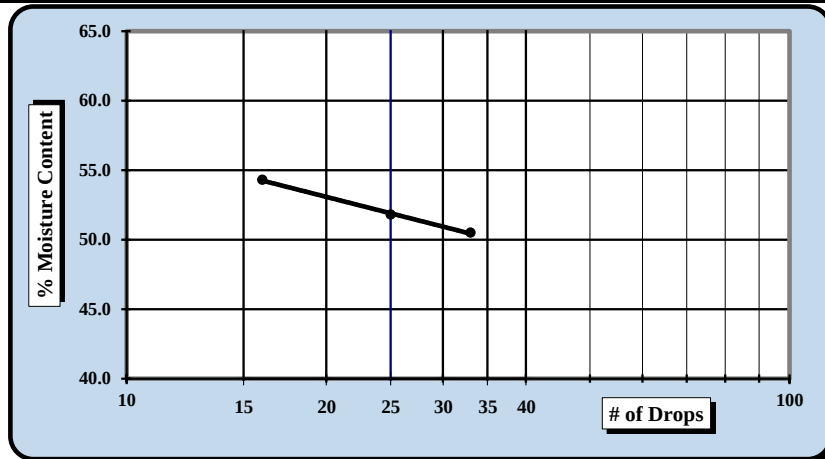
Project #: 23630075 Report Date: 5/5/2023
Project Name: Finklea Tract Test Date(s): 5/4/2023
Client Name: Horry County Maintenance
Client Address: 307 Smith Street, Conway, South Carolina 29526

Boring #: HA-1 to C-3 Sample #: BS-1 Sample Date: 4/25/2023
Location: Hand Auger Borings LAB #: 750 Depth: 0.5'-2.5'

Sample Description: Yellowish Brown and Orange Fat Clay (CH)

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	36158	10/7/2022	Grooving tool	36156	8/10/2022
LL Apparatus	18801	2/5/2023			
Oven	17745	9/27/2022			

Pan #		Liquid Limit						Plastic Limit		
Tare #:		12	16	19				22	126	
A	Tare Weight	14.58	14.62	14.88				14.87	14.88	
B	Wet Soil Weight + A	31.25	31.33	31.39				21.87	21.89	
C	Dry Soil Weight + A	25.66	25.63	25.58				20.44	20.46	
D	Water Weight (B-C)	5.59	5.70	5.81				1.43	1.43	
E	Dry Soil Weight (C-A)	11.08	11.01	10.70				5.57	5.58	
F	% Moisture (D/E)*100	50.5%	51.8%	54.3%				25.7%	25.6%	
N	# OF DROPS	33	25	16				Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average							25.7%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐
Liquid Limit **52**
Plastic Limit **26**
Plastic Index **26**
Group Symbol **CH**
Multipoint Method ☒
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Notes / Deviations / References:

Jason S. McGough	Jason S. McGough	Lab Supervisor	5/5/2023
Technician	Signature	Position	Date

Ron Forest, P.E.	RPF	Principal Engineer	5/5/2023
Technical Responsibility	Signature	Position	Date

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1330 Highway 501 Business,
Conway, SC 29526

HA-1 to C-3 BS-1 LIMITS D-4318-T89-90.xlsx
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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526

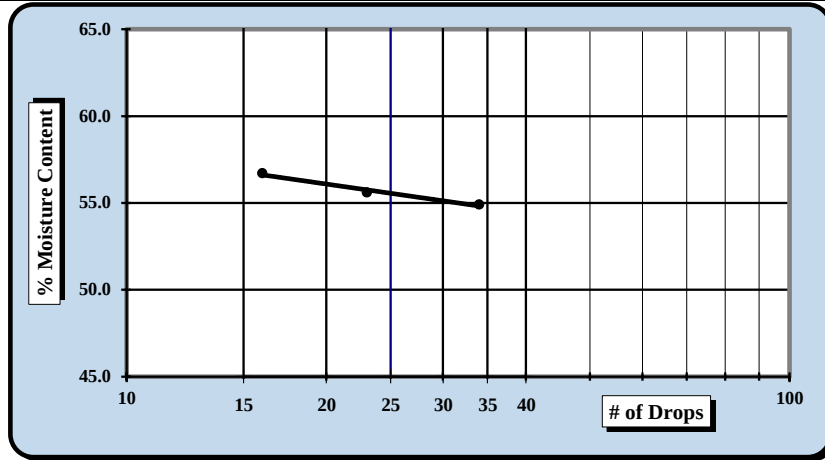
Project #: 23630075 Report Date: 5/5/2023
Project Name: Finklea Tract Test Date(s): 5/3/2023
Client Name: Horry County Maintenance
Client Address: 307 Smith Street, Conway, South Carolina 29526

Boring #: HA-3 Sample #: S-1 Sample Date: 4/25/2023
Location: Hand Auger Borings LAB #: 750 Depth: 1'-1.5'

Sample Description: Gray, Orange, and Red Sandy Fat Clay

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	36158	10/7/2022	Grooving tool	36156	8/10/2022
LL Apparatus	18801	2/5/2023			
Oven	17745	9/27/2022			

Pan #		Liquid Limit						Plastic Limit		
Tare #:		6	140	302				66	80	
A	Tare Weight	14.58	14.62	14.61				14.58	14.59	
B	Wet Soil Weight + A	31.22	31.28	31.36				21.74	21.77	
C	Dry Soil Weight + A	25.32	25.33	25.30				20.41	20.43	
D	Water Weight (B-C)	5.90	5.95	6.06				1.33	1.34	
E	Dry Soil Weight (C-A)	10.74	10.71	10.69				5.83	5.84	
F	% Moisture (D/E)*100	54.9%	55.6%	56.7%				22.8%	22.9%	
N	# OF DROPS	34	23	16				Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR									
Ave.	Average							22.9%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐
Liquid Limit **56**
Plastic Limit **23**
Plastic Index **33**
Group Symbol **CH**
Multipoint Method ☒
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☒ Air Dried ☒

Notes / Deviations / References:

Jason S. McGough	Jason S. McGough	Lab Supervisor	5/5/2023
Technician	Signature	Position	Date
Ron Forest, P.E.	RPF	Principal Engineer	5/5/2023
Technical Responsibility	Signature	Position	Date

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Conway, SC 29526

HA-3 S-1 LIMITS D-4318-T89-90.xlsx
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Form No. TR-D698-2
Revision No. : 1
Revision Date: 07/25/17

MOISTURE - DENSITY REPORT

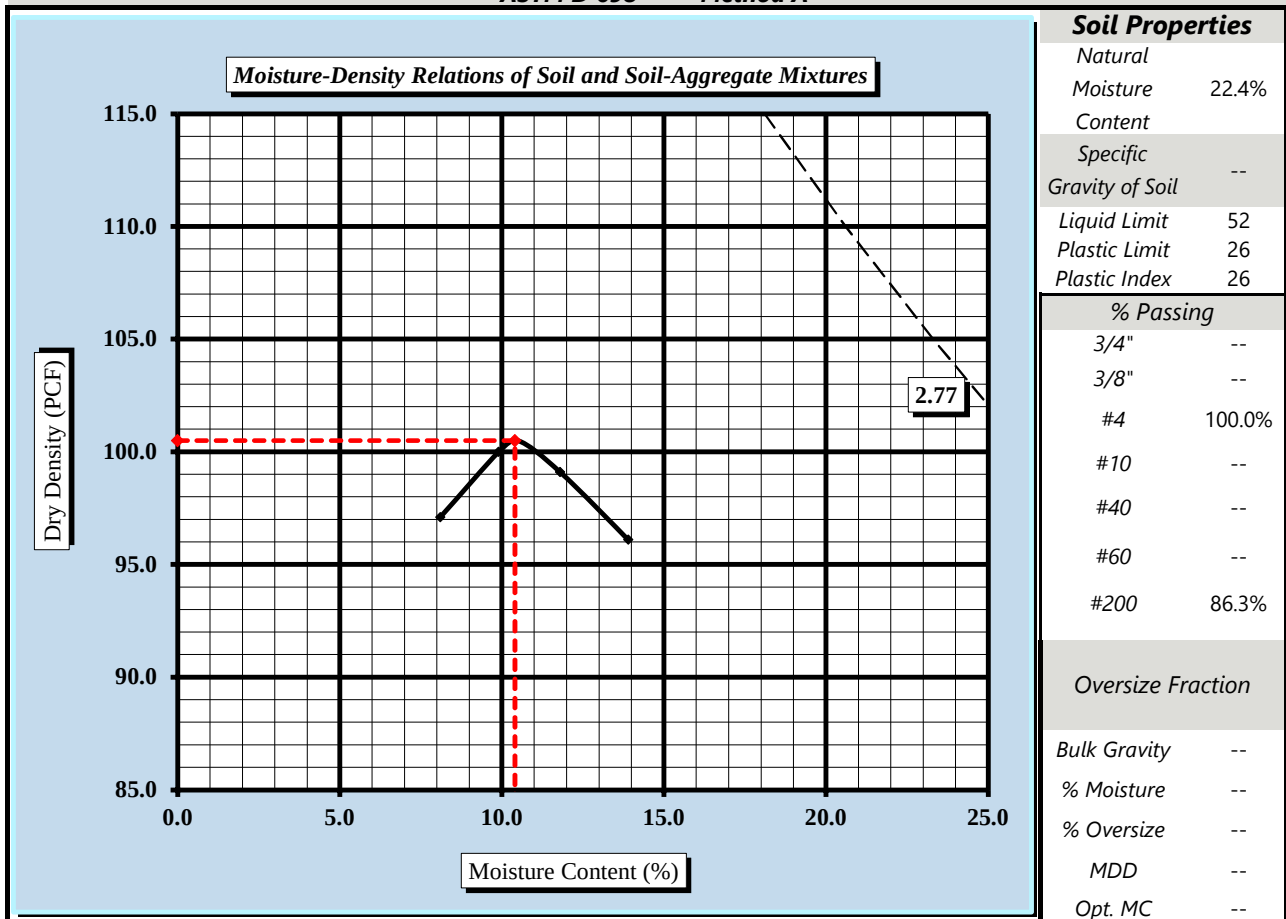


Quality Assurance

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526			
S&ME Project #:	23630075	Report Date:	5/5/2023
Project Name:	Finklea Tract	Test Date(s):	5/1/2023
Client Name:	Horry County Maintenance		
Client Address:	307 Smith Street, Conway, South Carolina 29526		
Boring #:	HA-1 to C-3	Sample #:	BS-1
		Sample Date:	4/25/2023
Location:	Hand Auger Borings	Lab #:	750
		Depth:	0.5'-2.5'
Sample Description:	Yellowish Brown and Orange Fat Clay (CH)		

Maximum Dry Density 100.5 PCF. Optimum Moisture Content 10.4%

ASTM D 698 - - Method A



Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐
Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐
Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations:

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

<u>Ron Forest, P.E.</u> Technical Responsibility	<u>RPF</u> Signature	<u>Principal Engineer</u> Position	<u>5/5/2023</u> Date

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S&ME, Inc. - Conway, SC	1330 Highway 501 Business, Conway, SC 29526	HA-1 to C-3 BS-1 PROCTOR (SOILS).xlsx Page 2 of 2

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

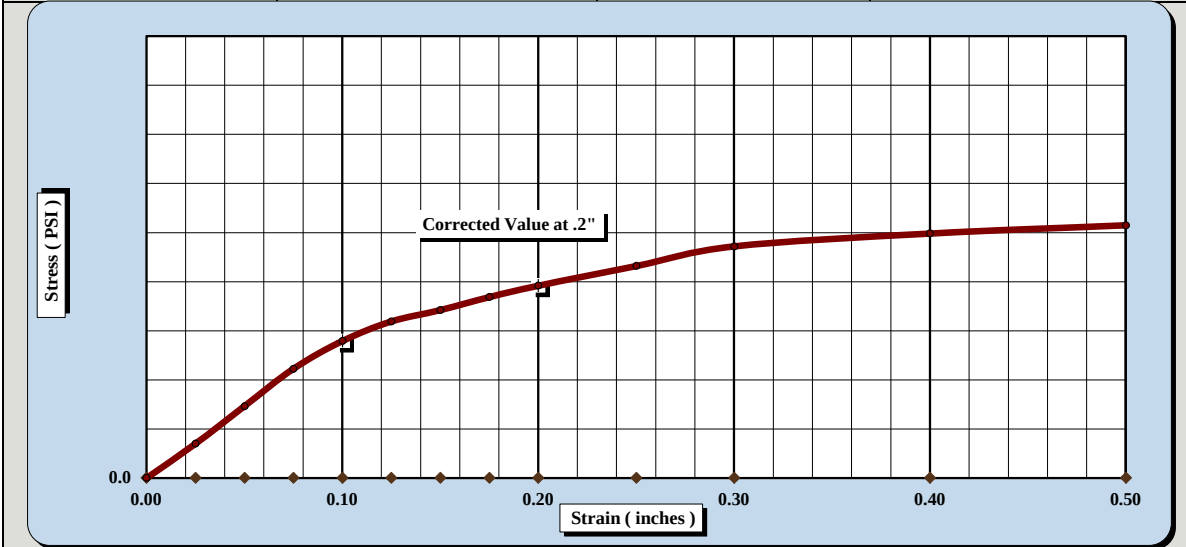


ASTM D 1883

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526		
Project #:	23630075	Report Date: 5/5/2023
Project Name:	Finklea Tract	Test Date(s) 5/1/2023
Client Name:	Horry County Maintenance	
Client Address:	307 Smith Street, Conway, South Carolina 29526	
Boring #:	HA-1 to C-3	Sample #: BS-1
Location:	Hand Auger Borings	Depth: 05'-2.5'
Sample Description:	Yellowish Brown and Orange Fat Clay (CH)	

ASTM D 698 Method A	Maximum Dry Density:	100.5	PCF	Optimum Moisture Content:	10.4%
Compaction Test performed on grading complying with CBR spec.				% Retained on the 3/4" sieve:	1.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	2.8	CBR at 0.1 in.	2.8
CBR at 0.2 in.	2.6	CBR at 0.2 in.	2.6



CBR Sample Preparation:
The entire gradation was used and compacted in a 6" CBR mold in accordance with ASTM D1883, Section 6.1.1

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	40	Final Dry Density (PCF)	63.7
Initial Dry Density (PCF)	98.9	Moisture Content (top 1" after soaking)	14.5%
Moisture Content of the Compacted Specimen	10.1%	Percent Swell	1.7%
Percent Compaction	98.4%		

Soak Time:	96 hrs.	Surcharge Weight	20.0	Surcharge Wt. per sq. Ft.	101.8
Liquid Limit	52	Plastic Index	26	Apparent Relative Density	--

Notes/Deviations/References: Liquid Limit: ASTM D 4318, Specific Gravity: ASTM D 854, Classification: ASTM D 2487

<u>Ron Forest, P.E.</u> Technical Responsibility	 Signature	<u>Principal Engineer</u> Position	<u>5/5/2023</u> Date
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S&ME, Inc. - Conway, SC	1330 highway 501 Business, Conway, SC 29526	HA-1 to C-3 BS-1 33428 CBR.xlsx	Page 3 of 3

MOISTURE, ASH, AND ORGANIC MATTER



ASTM D-2974

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526			
Project #:	23630075	Report Date:	5/5/2023
Project Name:	Finklea Tract	Test Date(s):	5/1/2023
Client Name:	Horry County Maintenance		
Client Address:	307 Smith Street, Conway, South Carolina 29526		
Boring #:	HA-1	Sample #:	S-3
Location:	Hand Auger Borings	Sample Date:	4/25/2023
	Lab #:	750	Depth: 0-0.5'
Sample Description: Brown Clayey Sand (SC)			
Equipment: Balance: 0.01 g. Readability, 500g. Minimum Capacity			
Balance:	S&ME ID #:	36158	Cal. Date: 10/7/2022 Due: 10/7/2023

Method A: Moisture Content Determination

Required Oven Temperature: 105 ± 5 °C

Oven Temperature: 105 °C		Tare #	Puce
t	Tare Weight (Dish plus Aluminum Foil Cover)	grams	82.60
a	Mass of As-Received Specimen + Tare Wt.	grams	593.70
b	Mass of Oven Dry Specimen + Tare Wt.	grams	508.30
w	Water Weight	(a-b)	85.40
A	Mass of As-Received Specimen	(a-t)	511.10
B	Mass of Oven Dry Specimen	(b-t)	425.70
% Moisture Content as a % of As Received or Total Mass		(w/A)*100	16.7%
% Moisture Content as a % of Oven-dried Mass		(w/B)*100	20.1%

Oven	S&ME ID #:	17745	Cal. Date:	9/27/2022	Due:	9/27/2023

Method C (440 °C) or D (750 °C): Ash Content and Organic Matter Determination

Muffle Furnace: 440 °C		Tare #	3
t	Tare Weight (Dish plus Aluminum Foil Cover)	grams	37.57
b	Mass of Oven Dry Specimen + Tare Wt.	grams	105.27
c	Ash Weight + Tare Wt.	grams	103.57
C	Ash Weight	c-t	66.00
B	Mass of Oven Dry Specimen	(b-t)	67.70
D	% Ash Content	(C/B)*100	97.5%
	% Organic Matter	100-D	2.5%

Muffle Furnace:	S&ME ID #:	N/A	Cal. Date:	N/A	Due:	N/A

Notes / Deviations / References: ASTM D2974: Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Jason s. McGough
Technician

Jason S. McGough
Signature

Lab Supervisor
Position

5/5/2023
Date

Ron Forest, P.E.
Technical Responsibility

RPF
Signature

Principal Engineer
Position

5/5/2023
Date

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MOISTURE, ASH, AND ORGANIC MATTER



ASTM D-2974

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526			
Project #:	23630075	Report Date:	5/5/2023
Project Name:	Finklea Tract	Test Date(s):	5/1/2023
Client Name:	Horry County Maintenance		
Client Address:	307 Smith Street, Conway, South Carolina 29526		
Boring #:	C-3	Sample #:	S-4
		Sample Date:	4/25/2023
Location:	Hand Auger Borings	Lab #:	750
		Depth:	0-0.5'
Sample Description: Brown Clayey Sand (SC)			
Equipment: Balance: 0.01 g. Readability, 500g. Minimum Capacity			
Balance:	S&ME ID #:	36158	Cal. Date: 10/7/2022 Due: 10/7/2023

Method A: Moisture Content Determination

Required Oven Temperature: 105 ± 5 °C

Oven Temperature: 105 °C		Tare #	G
t	Tare Weight (Dish plus Aluminum Foil Cover)	grams	82.40
a	Mass of As-Received Specimen + Tare Wt.	grams	682.90
b	Mass of Oven Dry Specimen + Tare Wt.	grams	568.60
w	Water Weight	(a-b)	114.30
A	Mass of As-Received Specimen	(a-t)	600.50
B	Mass of Oven Dry Specimen	(b-t)	486.20
% Moisture Content as a % of As Received or Total Mass		(w/A)*100	19.0%
% Moisture Content as a % of Oven-dried Mass		(w/B)*100	23.5%

Oven	S&ME ID #:	17745	Cal. Date:	9/27/2022	Due:	9/27/2023

Method C (440 °C) or D (750 °C): Ash Content and Organic Matter Determination

Muffle Furnace: 440 °C		Tare #	1
t	Tare Weight (Dish plus Aluminum Foil Cover)	grams	46.04
b	Mass of Oven Dry Specimen + Tare Wt.	grams	115.53
c	Ash Weight + Tare Wt.	grams	113.57
C	Ash Weight	c-t	67.53
B	Mass of Oven Dry Specimen	(b-t)	69.49
D	% Ash Content	(C/B)*100	97.2%
	% Organic Matter	100-D	2.8%

Muffle Furnace:	S&ME ID #:	N/A	Cal. Date:	N/A	Due:	N/A

Notes / Deviations / References: ASTM D2974: Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Jason S. McGough
Technician

Jason S. McGough
Signature

Lab Supervisor
Position

5/5/2023
Date

Ron Forest, P.E.
Technical Responsibility

RPF
Signature

Principal Engineer
Position

5/5/2023
Date

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SECTION 02281 – TERMITE CONTROL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

- A. Application of toxicant chemicals to all soil and earth-type material which will be covered by and lie immediately adjacent to building or additions so as to provide a lethal barrier to subterranean termites.

1.3 QUALIFICATIONS

- A. All work shall be accomplished by a bonded contractor whose principal business is pest control and anti-termite soil treatment, and who can show evidence of at least five years of successful operation in his field.
- B. Evidence of such qualifications shall be submitted for approval to the Architect prior to beginning any of the work.
- C. The applicator shall be licensed and bonded in the state where the project is located.
- D. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 1 needed by General Contractor.

1.4 CONTAINERS AND LABELING

- A. Toxicant shall be delivered to project site in sealed and labeled containers as supplied by the manufacturer or formulator. Labels shall bear manufacturer's warnings to be observed in handling and use of materials.
- B. Labels shall bear evidence of registration under the Federal Insecticide, Fungicide and Rodenticide Act.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01300 "Submittals".
- B. Product Data: Submit manufacturer's product data sheets on all products to be used for the work. Include the EPA-Registered Label.
- C. Product certificates.
- D. Soil Treatment Application Report: Include the following:
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Brand name and manufacturer of termiticide.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes, and rates of application used.
 - 6. Areas of application.
 - 7. Water source for application.

- E. Applicator Qualifications: Submit qualifications of applicator as detailed in 1.3 QUALIFICATIONS included in these specifications.
- F. Submit sample copy of final warranty as detailed in 1.6 WARRANTY included in these specifications.

1.6 WARRANTY

- A. Upon completion and prior to acceptance of the building by the Owner, the soil treatment applicator shall issue in an acceptable form, a written warranty to the Owner, co-signed by the general contractor stating the following provisions.
 - 1. That the chemicals having the required concentration and rate of application have been applied.
 - 2. The effectiveness of the soil treated will provide against infestation for a period of not less than 5 years. This warranty period shall be covered by a repair bond with no dollar value limit. The Owner shall have an option to renew security bond for the life of the building.
 - 3. Applicator shall make yearly inspections of the project and give a copy of his report to the Owner. Upon notice by the Owner of termite infestation, during this guarantee period, the Contractor shall provide promptly such treatment as may be necessary for the elimination and control of original new condition at contractor's expense.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. To the extent approved by governmental agencies having jurisdiction, use the following:
 - 1. Cyper TC applied as per label instructions.
 - 2. Probuild TC applied as per label instructions.
 - 3. Premise 75 by Bayer Corporation, applied as per label instructions.
 - 4. Baseline by FMC.
 - 5. Isoprosensos applied as per label instructions.
 - 6. Or approved equivalent.
- B. Above germicide to be applied by a South Carolina certified applicator.

PART 3 – EXECUTION

3.1 GENERAL

- A. At time soil treatment is to be applied, soil to be treated shall be in friable condition with a sufficiently low moisture content to allow uniform distribution of the soil treatment agent throughout the soil. Application shall be as a coarse spray and so as to provide uniform distribution of chemical on soil surfaces. All soil surfaces, which are disturbed after treatment and before placement of slabs and other covering structures, shall be retreated as originally specified. Application of chemicals shall not be made until all preparation for placing of slabs and other pertinent structures have been completed. Chemicals shall be applied at least 12 hours prior to placing of concrete and other structures which will be in contact with treated materials. Where concrete slabs and other structures are to be placed over vapor barrier or waterproof membrane, toxicant shall be applied immediately prior to placement of vapor barrier or waterproof membrane. Treatment of soil on exterior sides of foundation walls, grade beams and similar structures shall be coordinated with final grading and plating operations so as to avoid disturbance of chemical barriers by such operations.
- B. Manufacturer's warnings and precautions shall be observed in handling and use of soil toxicant. Care

shall be taken that these chemicals do not endanger supervision of a supervisor trained in pest control work.

- C. Rates and methods of application shall be in strict accordance with insecticide manufacturer's printed instructions or these specifications.

3.2 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct Conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.3 SLAB ON GRADE APPLICATION

- A. Apply toxicant as an overall treatment at the minimum rate of one gallon of toxicant to each 10 sq. ft. of area under slabs on grade within building lines.

3.4 UTILITY ENTRANCES APPLICATION

- A. Apply toxicant at the rate of two gallons of toxicant per five lin. ft. at critical locations such as where utilities pass through exterior walls and through floor slabs.
- B. Extend treatment not less than 48" from wall into trench.

3.5 WALLS APPLICATION

- A. Apply toxicant at the rate of two gallons per five lin. ft. along both sides of all foundations, walls, cross walls, and grade beams, after all nearby excavation has been completed.
- B. Apply toxicant at the rate of one gallon of toxicant per five lin. ft. to voids in masonry walls.

3.6 MISCELLANEOUS APPLICATIONS

- A. Apply toxicant at the rate of two gallons of toxicant per five lin. ft. at the following areas:
 - 1. Immediately below expansion joints, control joints, and all areas where slab will be penetrated by construction features.
 - 2. Where exterior facings or veneers extend below grade level along the exterior side of all foundation walls.
 - 3. Where unit masonry foundation construction is needed.
- B. Apply herbicide at barb between exterior wall & screen wall.

END OF SECTION 02281

SECTION 03000 – CONCRETE WORK (SITE)

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Installation of sidewalks and dumpster pad.
- B. General concrete work associated with utility installation.

1.3 RELATED SECTIONS

- A. Section 02300 "Trenching".

1.4 REFERENCES

- A. ACI 304 - Recommended Practice for measuring, Mixing, Transporting and Placing Concrete.
- B. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- C. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- D. ANSI/ASTM D1751 - Performed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- E. ANSI/ASTM D1752 - Performed Sponge Rubber and Cork Expansion Joint fillers for Concrete Paving and Structural Construction.
- F. ASTM A615 - Deformed and Plain Billet-Steel for a Concrete Reinforcement.
- G. ASTM C33 - Concrete Aggregates.
- H. ASTM C94 - Ready Mix Concrete.
- I. ASTM C150 - Portland Cement.
- J. ASTM C260 - Air-Entraining Admixtures for Concrete.
- K. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- L. ASTM C494 - Chemical Admixtures for Concrete.
- M. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.

1.5 SECTION DESCRIPTION

- A. The Contractor shall perform all work necessary or incidental to the performance and completion of concrete work. This work shall be completed as shown on the drawings and as specified in the contract documents. This work shall include the furnishing of all labor, materials and equipment.

The Contractor shall be responsible for coordinating the work to assure that the work is completed in an orderly manner. Although such work may not be specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. The Contractor will submit the names of suppliers of all concrete materials. Materials supplied on the project will meet the requirements of ACI 301-72, "Specifications for Structural Concrete for Buildings." Concrete will be a minimum of 4,000 psi standard 28 cylinder strength as shown on the plans with a maximum design slump of four (4) inches. Ready Mix Concrete must meet the requirements of ASTM C 94 "Specifications for Ready Mix Concrete". Concrete form work will meet the requirements of ACI 347 "Recommended Practice for Concrete Form Work."
- B. Reinforcing steel bars will be Grade 60 for bars No. 4 and larger and Grade 40 for No. 3 bars. Reinforcement bars will meet the requirements of ASTM A 615 for Billet Steel Bars.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect utilities that remain, from damage.
- D. Protect above and below grade utilities that remain.
- E. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- F. Protect bench marks, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- G. Moisten base to minimize absorption of water from fresh concrete.
- H. Coat surfaces of manhole and catch basin frames or other surfaces to be protected, with oil to prevent bond with concrete pavement.
- I. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

3.3 INSTALLATION

A. FORMING

- 1. Place and secure forms to correct location, dimension, and profile.
- 2. Assemble form work to permit easy stripping and dismantling without damaging concrete.

3. Place joint filler vertical in position, in straight lines. Secure to form work during concrete placement.

B. REINFORCEMENT

1. Place reinforcement as indicated on plans.
2. Interrupt reinforcement at contraction joints.

C. INSTALLATION

1. Concrete will not be placed when the temperature is forty (40) degrees Fahrenheit and falling or when freezing weather is predicted within twenty-four (24) hours. The Contractor may place concrete in cold weather if approved by the Engineer and the requirements of ACI 306, "Recommended Practice for Winter Concreting", are met. However, accelerator antifreezes and high early strength (Type III) concrete may not be utilized.

D. JOINTS

1. Place expansion joints at fifteen (15) foot intervals. Align curb, gutter, and sidewalk joints.
2. Place joint filler between paving components and building or other appurtenances. Recess top of filler 1/4 inch for sealant placement.
3. Provide grooved joints at five (5) foot intervals.

E. TESTING

1. Concrete testing will conform with ACI 301-72 Chapter H. Two concrete cylinders will be provided per test with two tested at seven days and two additional cylinders at twenty-eight days. One test (four cylinders) will be required per one hundred (100) cubic yards for each type concrete poured. Concrete failing the strength test will be repaired and/or replaced and retested at the Contractor's expense.
2. Concrete testing will be conducted by a laboratory selected by the Owner at the Owner's expense. The Contractor will be responsible for notifying the Owner, Engineer and testing laboratory a minimum of twenty-four (24) hours prior to placement of concrete.
3. Concrete mix test results will be submitted to the Engineer prior to initiating concrete work showing compliance with specifications. Engineer's approval of concrete mix does not relieve the Contractor of the responsibility for the performance of the concrete.

3.4 PAYMENT

- A. Payment for items under this section shall be as specified in the Contract Documents.

END OF SECTION 03000

SECTION 04160 – MASONRY MORTAR, ACCESSORIES AND JOINT REINFORCING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

- A. Furnish labor and materials to complete masonry work indicated, specified or both.

1.3 SAMPLES

- A. Submit samples of materials specified herein.

1.4 QUALITY ASSURANCE

- A. Standards:

- 1. American Society for Testing and Materials

- a. ASTM C91-87, Masonry Cement.
 - b. ASTM C144-87, Aggregate for Masonry Mortar.
 - c. ASTM C150-86, Portland Cement.
 - d. ASTM C207-84, Hydrated Lime for Masonry Purposes.
 - e. ASTM C270-87, Mortar for unit Masonry.
 - f. ASTM C387-87, Packaged, Dry, Combined Materials for Mortar and Concrete.

- 2. Brick Institute of America

- a. BIA M 1-72, Portland Cement-Lime Mortar for Brick Masonry

- 3. Uniform Building Code

- a. UBC 24-23, Field Test for Grout and Mortar

PART 2 – PRODUCTS

2.1 MASONRY MORTAR

- A. ASTM C-91-87, Brixment, Magnolia, Lone Star, Giant/Dark or approved substitution.

2.2 MORTAR MIXES

- A. Mortar mixes for face brick, concrete masonry units, etc., unless otherwise noted, indicated or specified.
- B. ASTM C-270 Proportion specifications, and of the following type:
 - 1. Type S for exterior work and all load bearing units.
- C. Colored mortar shall be as manufactured by Solomon Grind-Chem Services, Inc. Mortar colors

shall be as selected by Architect. (See drawings for locations if required).

2.3 SAND

- A. Sand shall be clean, sharp, free for deleterious substances, and in accordance with ASTM C-144 of approved color, except for joints 1/4" or less, use aggregate grades with 100% passing the No.16 sieve.

2.4 WATER

- A. Water for mixing shall be fresh and clean, free from excess acid, alkalis and other deleterious matter.

2.5 MASONRY JOINT REINFORCEMENT

- A. Ladder Type:
 - 1. Joint reinforcing shall be standard hot dip galvanized DUR-O-WAL or equivalent products manufactured by Howman and Barnard, Inc. or Southern Wire Mesh Company. Size of reinforcing shall be 4S for 4" walls, 6S for 6" walls, 10S for 10" walls, 12S for 12" walls, and 14S for 14" walls and 16S for 16" walls. Reinforcing for cavity walls shall have drip cross rods.

2.6 ANCHORING DEVICE FOR MASONRY

- A. Provide "Post-I-Tie Wing Nut" by Heckman Building Products or approved equivalent. Coordinate with required building rigid insulation thickness as indicated on the contract documents.

2.7 MORTAR DROPPING COLLECTION DEVICES

- A. Provide mortar dropping collection device in air cavity wythe between exterior masonry veneer and inner CMU wall or wall sheathing substrate by "Mortar Net" as distributed through Waccamaw Brick Company in Myrtle Beach, SC (or approved equivalent). Units to be size for cavity widths constructed, verify with drawings.
- B. Units to be in continuous runs at all through-wall flashing locations where indicated on drawings.

2.8 MORTAR MAZE WEEP SYSTEM

- A. Provide 3/8" x 3-1/2" x 3-1/2" Mortar Maze Weeps by Advance Building Products, Inc. (or approved equivalent) at 24" O.C., typical at all through-wall flashing weeps where indicated on the drawings.

PART 3 – EXECUTION

3.1 MORTAR

- A. Mortar shall be mixed as per manufacturers recommendations or in proportions of 1 sack of masonry cement to 3 cu. ft. of dry sand in a mechanical type batch mixer; use of a continuous mortar mixer will not be permitted.
- B. Only one brand of mortar mix shall be used throughout the work and shall come from the same source.
- C. Mix mortar ingredients for a minimum of 5 minutes in a mechanical batch mixer.

- D. Do not use mortar which has begun to set, or if more than 2-1/2 hours have elapsed since initial mixing.
- E. Re-temper mortar during 2-1/2 hour period as required to restore workability.

3.2 STORAGE OF MATERIALS

- A. Masonry mortar shall be stored under cover in a dry place.
- B. Sand storage piles shall be kept free from contaminants.

3.3 HORIZONTAL JOINT REINFORCING

- A. Reinforcing shall be provided in all interior and exterior masonry walls on 16" centers and in the course above and/or below all openings 32" longer than openings.
- B. Provide continuous horizontal joint reinforcing as shown and specified.
- C. Fully embed longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls and 1/2" at other locations.
- D. Lap reinforcement a minimum of 6" at ends of units.
- E. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections.
- F. Cut and bend units as directed by manufacturer for continuity of returns, offsets, pipe enclosures and other special conditions.
- G. Reinforce masonry openings with horizontal joint reinforcing placed in 2 horizontal joints approximately 8" apart, both immediately above the lintel and immediately below the sill.

3.4 TIES

- A. Tie exterior wythe to back-up with continuous horizontal joint reinforcing embedded in mortar joints at not more than 16" o.c. vertically.
- B. Where impossible or impracticable to install joint reinforcing, walls shall be tied using 1/4" diameter triangular ties with 12 ga., anchor straps.

END OF SECTION 04160

SECTION 04219 – SMOOTH FACE CONCRETE MASONRY UNITS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:

- 1. Smooth face concrete masonry units (CMUs).

See drawings for applicable items.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Section 05500 – Metal Fabrications for furnishing steel lintels and shelf angles for unit masonry.
- C. Section 07600 – Sheet Metal Flashing and Trim for furnishing manufactured reglets installed in masonry joints for metal flashing.

1.4 WORK INCLUDED

- A. Furnish labor and materials to complete masonry work indicated, specified or both.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
- C. Samples for each type and color of exposed masonry units and colored mortars.
- D. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.
 - 1. For masonry units include material test reports substantiating compliance with requirements.
- E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1.6 SAMPLES

- 1. The contractor shall submit to the architect for approval three full size samples of concrete masonry units.

1.7 QUALITY ASSURANCE

- F. Pre-installation conference: Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Contractor shall notify Architect of conference date, time, and location and also verify receipt of approved shop drawings by installer prior to conference. Conference shall include the following attendees: Representatives for Owner, Architect, Engineer, GC's project manager and site superintendent, installer's field superintendent, manufacturer's representative, and any other parties involved with preparation and installation of material and all accessories.
- G. 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 other means, as acceptable to authorities having jurisdiction.
- H. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects.
 - 1. Build sample panels for each type of exposed unit masonry construction typical exterior wall in sizes approximately 48 inches long by 48 inches high.

1.8 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in **ACI 530.1/ASCE 6/TMS 602, Section 2104.3 in the International Building Code**.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 – PRODUCTS

2.1 SMOOTH FACE CONCRETE MASONRY UNITS

- A. Smooth Face concrete masonry units are (size as indicated on drawings) as follows:
 - 1. Smooth CMU:
3 5/8" x 7 5/8" x 15 5/8" **Smooth** Face Veneer units. Color to be selected from manufacturers full range of color selections.
- B. Approved Manufacturers:
 - 1. Adams Old Castle Company
2517 Big Block Road
Myrtle Beach, SC 29588
(843) 215-2900
 - 2. Cemex (855) 292-8453
 - 3. Carolina Prestress (843) 394-3545
 - 4. Or prior approved equivalent. See Section 01632

PART 3 – EXECUTION

3.1 JOINTS AND BONDS

- A. Concrete masonry units shall be laid in running bond, unless otherwise noted, with approximately 3/8" joints. Joints shall be concave tooled with jointing tool at least 24" long.

3.2 WORKMANSHIP

- A. Lay hollow concrete masonry units with full mortar coverage of horizontal and vertical face shells: Also, bed webs in mortar in starting course on footings and foundation walls and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or to be filled with concrete or grout.
- B. All vertical and horizontal joints shall be of uniform thickness and width.
- C. All masonry shall be laid in straight and uniform course, with horizontal joints straight and dead level and with vertical joints plumb with one directly over the other, and with all faces and corners plumb, straight and true.
- D. Cutting of masonry units shall be by power saw, raw and cut edges shall be as straight and true as natural edges of the units. Wherever possible use full size units instead of cut units.
- E. Coordinate with other trades for items to be built into masonry building work required as work progresses. Cutting and patching for this and all trades shall be done by masonry mechanics.
- F. Step back unfinished work for joining with new work; toothing may be resorted to only when approved by the architect.
- G. Before new work is started, remove loose mortar and wet thoroughly before laying new work.
- H. Prior to laying any masonry units, course rods shall be prepared with markings for each course.

3.3 REINFORCED UNIT MASONRY

- A. Vertical unit masonry cells to be filled shall have alignment to maintain clear, unobstructed vertical cell, continuous to foundation, equal to the cell void of an individual masonry unit. Remove mortar droppings and debris from cells to be grouted.
- B. Provide clean-outs at bottom of each vertically reinforced cell, at each pour of grout. Seal clean-outs after inspection of reinforcement, before grouting begins with concrete unit masonry or formwork.
- C. Place reinforcement in accord with drawings, lapping as indicated. Secure at bottom and top of intervals not exceeding 192 bar diameters.
- D. Except as otherwise indicated, provide at least 8" of solid end bearing full height of wall for lintels, beams and other load supporting members.
- E. Fill reinforced cells with cement grout in maximum of 5'-0" lifts, consolidating by vibrating and rodding.
- F. Form horizontal construction joints in grout lifts by stopping grout pour 1-1/2" below top of uppermost course in pour.

3.4 WORK IN FREEZING WEATHER

- A. Masonry shall not be laid when the temperature of the surrounding atmosphere is 40 degrees F., or less or is likely to fall below 40 degrees F., in the 24-hour period after laying, unless adequate protection is provided, and the procedure approved by the project engineer.
- B. No foreign or frozen materials (containing ice) shall be used.

3.5 PROTECTION

- A. All finished work shall be protected against freezing for a period of not less than 48 hours by means of enclosures, artificial heat and such other protective methods as may be required.
- B. Tops of walls left incomplete at the end of a day's work shall be carefully covered with membrane material securely held in place.

3.6 CLEANING AND POINTING

- A. During the progress of the work the masonry shall be kept in as clean a condition as possible. Remove excess materials and mortar droppings daily.
- B. Upon completion, all masonry work shall be thoroughly cleaned, using methods and/or materials as approved and recommended by the manufacturer of masonry units.
- C. As the cleaning progresses, the surface shall be examined to locate cracks, holes or other defects. All such defects shall be carefully repaired, pointed up, and filled with mortar.

END OF SECTION 04219

SECTION 04220 – CONCRETE MASONRY UNITS

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:

- 1. Concrete masonry units (CMUs).

See drawings for applicable items.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Section 05500 – Metal Fabrications for furnishing steel lintels and shelf angles for unit masonry.
- C. Section 07620 – Sheet Metal Flashing and Trim for furnishing manufactured reglets installed in masonry joints for metal flashing.

1.3 WORK INCLUDED

- A. Furnish labor and materials to complete masonry work indicated, specified or both.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
- C. Samples for each type and color of exposed masonry units and colored mortars.
- D. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.
 - 1. For masonry units include material test reports substantiating compliance with requirements.
- E. Mix Designs: For each type of mortar **and grout**. Include description of type and proportions of ingredients.

1.5 QUALITY ASSURANCE

- A. Pre-installation conference: Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Contractor shall notify Architect of conference date, time, and location and also verify receipt of approved shop drawings by installer prior to conference. Conference shall include the following attendees: Representatives for Owner, Architect, Engineer, GC's project manager and site superintendent, installer's field

superintendent, manufacturer's representative, and any other parties involved with preparation and installation of material and all accessories.

- B. 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 other means, as acceptable to authorities having jurisdiction.
- C. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects.
 - 1. Build sample panels for each type of exposed unit masonry construction typical exterior wall in sizes approximately 48 inches long by 48 inches high.

1.6 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in **ACI 530.1/ASCE 6/TMS 602, Section 2104.3 in the International Building Code.**
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 – PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Shall conform Masonry Units, ASTM C-90.
- B. Moisture content at time of delivery shall not exceed 30%.
- C. Units shall have modular dimensions and be of widths as indicated on plans.
- D. Units shall be manufactured from granite, limestone, gravel or a mixture of these with other suitable aggregates, such as sand, granite screening or other approved materials.
- E. Minimum compressive strength 2000 psi based on average gross area.
- F. Provide Grade N-1 45 degree Masonry Units, ASTM C-90 for 45 degree cornered walls. 45 degree Concrete Masonry Units shall be manufactured as outlined in items A through G.

PART 3 – EXECUTION

3.1 JOINTS AND BONDS

- A. Concrete masonry units shall be laid in running bond, unless otherwise noted, with approximately 3/8" joints. Joints shall be concave tooled with jointing tool at least 24" long.

3.2 WORKMANSHIP

- A. Lay hollow concrete masonry units with full mortar coverage of horizontal and vertical face shells: Also, bed webs in mortar in starting course on footings and foundation walls and in all courses of

piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or to be filled with concrete or grout.

- B. All vertical and horizontal joints shall be of uniform thickness and width.
- C. All masonry shall be laid in straight and uniform course, with horizontal joints straight and dead level and with vertical joints plumb with one directly over the other, and with all faces and corners plumb, straight and true.
- D. Cutting of masonry units shall be by power saw, raw and cut edges shall be as straight and true as natural edges of the units. Wherever possible use full size units instead of cut units.
- E. Coordinate with other trades for items to be built into masonry building work required as work progresses. Cutting and patching for this and all trades shall be done by masonry mechanics.
- F. Step back unfinished work for joining with new work; toothing may be resorted to only when approved by the architect.
- G. Before new work is started, remove loose mortar and wet thoroughly before laying new work.
- H. Prior to laying any masonry units, course rods shall be prepared with markings for each course.

3.3 REINFORCED UNIT MASONRY

- A. Vertical unit masonry cells to be filled shall have alignment to maintain clear, unobstructed vertical cell, continuous to foundation, equal to the cell void of an individual masonry unit. Remove mortar droppings and debris from cells to be grouted.
- B. Provide clean-outs at bottom of each vertically reinforced cell, at each pour of grout. Seal clean-outs after inspection of reinforcement, before grouting begins with concrete unit masonry or formwork.
- C. Place reinforcement in accord with drawings, lapping as indicated. Secure at bottom and top of intervals not exceeding 192 bar diameters.
- D. Except as otherwise indicated, provide at least 8" of solid end bearing full height of wall for lintels, beams and other load supporting members.
- E. Fill reinforced cells with cement grout in maximum of 5'-0" lifts, consolidating by vibrating and rodding.
- F. Form horizontal construction joints in grout lifts by stopping grout pour 1-1/2" below top of uppermost course in pour.

3.4 WORK IN FREEZING WEATHER

- A. Masonry shall not be laid when the temperature of the surrounding atmosphere is 40 degrees F., or less or is likely to fall below 40 degrees F., in the 24-hour period after laying, unless adequate protection is provided, and the procedure approved by the project engineer.
- B. No foreign or frozen materials (containing ice) shall be used.

3.5 PROTECTION

- A. All finished work shall be protected against freezing for a period of not less than 48 hours by means

of enclosures, artificial heat and such other protective methods as may be required.

- B. Tops of walls left incomplete at the end of a day's work shall be carefully covered with membrane material securely held in place.

3.6 CLEANING AND POINTING

- A. During the progress of the work the masonry shall be kept in as clean a condition as possible. Remove excess materials and mortar droppings daily.
- B. Upon completion, all masonry work shall be thoroughly cleaned, using methods and/or materials as approved and recommended by the manufacturer of masonry units.
- C. As the cleaning progresses, the surface shall be examined to locate cracks, holes or other defects. All such defects shall be carefully repaired, pointed up, and filled with mortar.

END OF SECTION 04220

SECTION 04222 – BRICK MASONRY UNITS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

- A. Furnish labor and materials to complete brick masonry work indicated, specified or both.

1.3 WORK NOT INCLUDED

- A. Concrete brick shall be as specified in standard concrete masonry units.

1.4 QUALITY ASSURANCE

- A. Field Constructed Mock-Up Panel:

1. The Contractor shall lay up a sample panel of masonry work at the job site. Panel is to include all types of building detailing, setbacks, soldier coursing, row cocks, etc., and to also include horizontal reinforcements and flashing to the approval of the Architect, prior to starting of any masonry work. This sample shall be partially demolished to observe joint work, reinforcement and flashing for correct execution and standard of quality for work and is to remain throughout the construction of the project, as a reference standard for all work. Sample panel shall be a minimum of 48" high and 48" long and shall include face and backup wythes.
2. Locate mock-up on the site as directed by the Architect.
3. Protect top and back of mock-up from direct weathering.

- B. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

1.5 SUBMITTALS

- A. Sample: The contractor shall submit to the architect for approval a four-brick rack sample of proposed masonry substitutions.

1.6 PRODUCT HANDLING

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.

PART 2 – PRODUCTS

2.1 FACE BRICK

A. Utility Brick:

1. ASTM C216-92D, Grade SW. Type FBX
2. Dimensions: 3-5/8" x 3-5/8" x 11-5/8.
3. Brick veneer shall be a utility. Colors to be determined.

B. Provide solids at ends of rowlocks and other locations where "cored brick" would normally show. No exposed cores.

PART 3 – EXECUTION

3.1 JOINTS AND BONDS

- #### A. Exterior utility brick shall be laid in one third (1/3) running bond such that every fourth course vertical joint matches unless noted otherwise, with approximately 3/8" joints. (2 brick and 2 joints = 8".) Unless noted otherwise, joints shall be concave tooled with jointing tool at least 24" long.

3.2 WORKMANSHIP

- #### A. All masonry shall be laid in full and even bed of mortar completely filling end and side joints as well as beds. All head joints must be full (no slushing allowed).
- #### B. All vertical and horizontal joints shall be of uniform thickness and width.
- #### C. All masonry shall be laid in straight and uniform course, with horizontal joints straight and dead level and with vertical joints plumb with one directly over the other, and with all faces and corners plumb, straight and true.
- #### D. Cutting of masonry units shall be by power saw, raw and cut edges shall be as straight and true as natural edges of the units. Wherever possible use full size units instead of cut units.
- #### E. Coordinate with other trades for items to be built into masonry, building items required as work progresses. Cutting and patching for this and all trades shall be done by masonry mechanics.
- #### F. Step back unfinished work for joining with new work; toothing may be resorted to only when approved by the project engineer or architect.
- #### G. Before new work is started, remove loose mortar and wet thoroughly before laying new work.
- #### H. Clay units shall be wet if laid in warm, dry weather, kept dry in cold weather.
- #### I. Install all through-wall flashing where shown, lap all joints a minimum of 4". Waterproof laps by through buttering of flashings with approved mastics or sealants.
- #### J. Tolerances: Variations from true plumb and variations of elevation of installed brick shall not exceed 1/4" in 10' or 3/8" in a story height of 20' maximum. At external corners, expansion joints and other conspicuous lines, do not exceed 1/4" in any one story or 20' maximum.
- #### K. Recessed or projected masonry accent features in masonry veneer abutting metal building trim, door frames, etc., shall be flush to provide a straight, even sealant joint intersection between masonry and trim, typ.

3.3 WALLS

A. Masonry

1. Walls at locations indicated on drawings shall consist of a 4" thick facing wythe of brick and a masonry back up wythe of thickness indicated.
2. The facing wythe shall be tied to the masonry back up with continuous truss type joint reinforcement as specified in Section 04160 "Masonry Mortar, Accessories and Joint Reinforcing".

3.4 CAVITY WALLS

- A. Keep cavity air space and crossties of reinforcing free of mortar drippings by using a continuous wood or metal strip set up temporarily on wall anchors. Raise strip as the wall is built-up.
- B. Provide weep holes in vertical horizontal joints of facing wythe directly above wall flashings and at each floor line. Space weep hole 24" apart horizontally.

3.5 WORK IN FREEZING WEATHER

- A. Masonry shall not be laid when the temperature of the surrounding atmosphere is 40 degrees F., or less or is likely to fall below 40 degrees F in the 24 hour period after laying, unless adequate protection is provided, and the procedure approved by the project engineer or architect.
- B. No foreign or frozen materials (containing ice) shall be used.

3.6 PROTECTION

- A. All finished work shall be protected against freezing for a period of not less than 48 hours by means of enclosures, artificial heat and such other protective methods as may be required.
- B. Tops of walls left incomplete at the end of a day's work shall be carefully covered with membrane material securely held in place.
- C. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
- D. Protect sills, ledges, and projections from mortar droppings.
- E. Protect surfaces of window and doorframes, as well as similar products with painted and integral finishes from mortar droppings.

3.7 CLEANING AND POINTING

- A. During the progress of the work the masonry shall be kept in as clean a condition as possible. Remove excess materials and mortar drippings daily.
- B. Upon completion, all masonry work shall be thoroughly cleaned, using methods and/or materials as approved and recommended by the manufacturer of masonry units. Final Cleaning shall eliminate all excess mortar from the face of the masonry unit. Power washing systems that damage "green" joint work are unacceptable.
- C. As the cleaning progresses, the surface shall be examined to locate cracks, holes, or other defects. All such defects shall be carefully repaired, pointed up, and filled with mortar.

END OF SECTION 04222

SECTION 04510 – MASONRY CLEANING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SCOPE

- A. This contractor shall furnish all labor, superintendence, material, equipment, plant and services to complete the masonry cleaning as shown on the drawings and/or as herein specified.
- B. Cleaning shall include all exterior masonry surfaces.

PART 2 – PRODUCTS

2.1 METHOD

- A. Brick Masonry Unit Cleaning shall be by high-pressure hot water or chemical detergent mixture as recommended by the brick manufacturer.

2.2 PREPARATION OF SURFACES

- A. Provide all necessary shields, barriers, window protection, etc., in order to properly execute this work with the least possible inconvenience to the occupants of the building and the public.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. The purpose of this cleaning method is to thoroughly remove all dirt, grime and loose particles from the surface of the masonry in such a manner as to cause no disruption and harm to the face of the masonry. The action of this cleaning method is to be one of scouring and scrubbing only.
- B. The pump used to develop the pressure is to be gasoline or diesel driven, capable of maintaining pressures of 1200 psi at minimum elevations of 300 feet above the pump.
- C. A special nozzle is to contain a device allowing the water stream to be aerated thereby breaking up the force of the water stream as the result of aeration.
- D. If necessary, where dirty surfaces required, the masonry wall surface shall be soaked prior to cleaning with hi-pressure water nozzle or by previous setting with hoses or perforated piping. Where extremely dirty areas occur it may also be necessary to use a mild acid solution with the architect's approval.
- E. Specified areas shall be thoroughly cleaned and washed down starting from the top. Focus special attention on stained areas and hard to clean areas.

END OF SECTION 04510

SECTION 05120 – STRUCTURAL STEEL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes structural steel.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01401 "Quality Control and Special Inspections" for independent testing agency procedures and administrative requirements.
 - 2. Division 5 Section 05500 "Metal Fabrications" for loose steel bearing plates and miscellaneous steel framing.
 - 3. Division 9 Section 09900 "Painting" for surface preparation and priming requirements.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.
- B. Engineering Responsibility: Engage a fabricator who utilizes a qualified professional engineer to prepare calculations, Shop Drawings, and other structural data for structural steel connections.

1.4 SUBMITTALS

- A. Shop Drawings detailing fabrication of structural steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
 - 4. Include Shop Drawings signed and sealed by a qualified professional engineer responsible for their preparation.
- B. 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.
- C. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.
 - 1. Structural steel, including chemical and physical properties.
 - 2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
 - 3. Direct-tension indicators.
 - 4. Shear stud connectors.
 - 5. Shop primers.

6. Nonshrink grout.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
 1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant as follows:
 - a. Category: Category I, conventional steel structures.
- C. Comply with applicable provisions of the following specifications and documents:
 1. AISC's "Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design".
 2. AISC's "Specification for Allowable Stress Design of Single-Angle Members".
 3. AISC's "Seismic Provisions for Structural Steel Buildings".
 4. ASTM A 6 (ASTM A 6M) "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use".
 5. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".
- D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.
- E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel".
 1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- F. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section 01200 "Project Meetings" needed by general contractor.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.

2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.7 SEQUENCING

- A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Structural Steel Shapes, Plates, and Bars: As follows:
 1. Carbon Steel: ASTM A 36 (ASTM A 36M), unless noted otherwise on drawings.
 2. High-Strength, Low-Alloy Columbium-Vanadium Steel: ASTM A 572 (ASTM A 572M), Grade 50, as noted on drawings.
 3. High-Strength, Low-Alloy Structural Steel: ASTM A 588 (ASTM A 588M), Grade 50, corrosion resistant, as noted on drawings.
- B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.
- C. Hot-Formed Structural Steel Tubing: ASTM A 501.
- D. Steel Pipe: ASTM A 53, Type E or S, Grade B.
 1. Weight Class: Standard, unless noted otherwise on drawings.
 2. Weight Class: Extra strong, as noted on drawings.
 3. Weight Class: Double-extra strong, as noted on drawings.
 4. Finish: Black, except where indicated to be galvanized.
- E. Carbon-Steel Castings: ASTM A 27, Grade 65-35 (ASTM A 27M, Grade 450-240), medium-strength carbon steel, unless noted otherwise.
- F. High-Strength Steel Castings: ASTM A 148, Grade 80-50 (ASTM A 148M, Grade 550-345).
- G. Shear Connectors: ASTM A 108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.
- H. Anchor Rods, Bolts, Nuts, and Washers: As follows:
 1. Unheaded Rods: ASTM A 36 (ASTM A 36M), unless noted otherwise on drawings.
 2. Unheaded Rods: ASTM A 572, Grade 50 (ASTM A 572M, Grade 345).
 3. Headed Bolts: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; and carbon-steel nuts, unless otherwise noted on drawings.
 4. Headed Bolts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
 5. Washers: ASTM A 36 (ASTM A 36M).
- I. Nonhigh-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Plain, uncoated.
 2. Finish: Hot-dip zinc-coating, ASTM A 153, Class C.
- J. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers, unless otherwise noted on drawings.
1. Finish: Plain, uncoated.
 2. Finish: Hot-dip zinc-coating, ASTM A 153, Class C.
 3. Direct-Tension Indicators: ASTM F 959, Type 325, as noted on drawings.
 - a. Finish: Plain, uncoated.
 - b. Finish: Mechanically deposited zinc-coating, ASTM B 695, Class 50, for exposed steel.
- K. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers, uncoated.
1. Direct-Tension Indicators: ASTM F 959, Type 490, uncoated.
- L. Welding Electrodes: Comply with AWS requirements.

2.2 PRIMER

- A. Primer: Red oxide or zinc chromate meeting SSPC-Paint 1 or SSPC-Paint 11.
- B. Primer: Zinc-Rich primer meeting SSPC-Paint 5 for exposed steel members.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

2.3 GROUT

- A. Metallic, Shrinkage-Resistant Grout: Premixed, factory-packaged, ferrous aggregate grout, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time.
- B. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time, for exposed steel.

2.4 FABRICATION

- A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.
 1. Camber structural steel members where indicated.
 2. Identify high-strength structural steel according to ASTM A 6 (ASTM A 6M) and maintain markings until steel has been erected.
 3. Mark and match-mark materials for field assembly.
 4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
 5. Complete structural steel assemblies, including welding of units, before starting shop-priming

- operations.
6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
- B. Fabricate architecturally exposed structural steel with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.
1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
 2. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded.
- D. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.
- E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's printed instructions.
- F. Welded Door Frames: Build up welded door frames attached to structural steel framing. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches (250 mm) o.c., unless otherwise indicated.
- G. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.
1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
 2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

2.5 SHOP CONNECTIONS

- A. Shop install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.
- B. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".
1. Bolts: ASTM A 325 (ASTM A 325M) high-strength bolts, unless otherwise indicated.
 2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections, on drawings.
- C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
 2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch (13 mm)

and larger. Grind flush butt welds. Dress exposed welds.

2.6 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections.
 - 4. Surfaces to receive sprayed-on fireproofing.
 - 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications at manufacturer's option as follows:
 - 1. SSPC-SP 2 "Hand Tool Cleaning".
 - 2. SSPC-SP 3 "Power Tool Cleaning".
 - 3. SSPC-SP 7 "Brush-Off Blast Cleaning".
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

2.7 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A 123.

2.8 SOURCE QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform shop inspections and tests and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
 - 2. Provide testing agency with access to places where structural steel Work is being fabricated or produced so required inspection and testing can be accomplished.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".

- E. Shop-bolted connections will be tested and inspected according to RCSC's "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".
 - 1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.
- F. In addition to visual inspection, shop-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T".
 - 4. Ultrasonic Inspection: ASTM E 164.
- G. In addition to visual inspection, shop-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:
 - 1. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.
- B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.
- B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not

- remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
 - a. Comply with manufacturer's instructions for proprietary grout materials.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges".
1. Maintain erection tolerances of architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges".
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
 2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- E. Splice members only where indicated, and accepted on shop drawings.
- F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
- G. Do not use thermal cutting during erection.
- H. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.
- ### 3.4 FIELD CONNECTIONS
- A. Install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.
- B. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".
1. Bolts: ASTM A 325 (ASTM A 325M) high-strength bolts, unless otherwise indicated.
 2. Bolts: ASTM A 490 (ASTM A 490M) high-strength bolts, unless otherwise indicated.
 3. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections on drawings.
- C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch (13 mm) and larger. Grind flush butt welds. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".
- E. Field-bolted connections will be tested and inspected according to RCSC's "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".
 - 1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.
- F. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T".
 - 4. Ultrasonic Inspection: ASTM E 164.
- G. In addition to visual inspection, field-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:
 - 1. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

3.6 CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
 - 1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils (0.038 mm).
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A 780.

END OF SECTION 05120

SECTION 05400 – COLD-FORMED METAL FRAMING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Steel trusses.
 - 2. Exterior sheathing and air-infiltration barriers.
 - 3. See structural drawings for applicability of above and locations.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 5 Section 05500 "Metal Fabrications" for masonry shelf angles and connections.
 - 2. Division 9 Section 09255 "Gypsum Board Assemblies" for gypsum board and nonload-bearing metal-stud framing and ceiling-suspension assemblies.

1.3 PERFORMANCE REQUIREMENTS

- A. AISI "Specifications": Calculate structural characteristics of cold-formed metal framing according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members" and the following:
- B. Structural Performance: Engineer, fabricate and erect cold-formed metal framing with the following minimum physical and structural properties:
 - 1. Physical and Structural Properties: As indicated on drawings.
 - 2. Design Loads: As indicated.
 - 3. Design framing systems to withstand design loads without deflections greater than the following:
 - a. Roof Trusses: Vertical deflection of 1/240 of the span, for non-brittle ceiling finish.
 - b. Roof Trusses: Vertical deflection of 1/360 of the span.
 - 4. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 120 deg F.
 - 5. Design framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.
- C. Engineering Responsibility: Engage a fabricator who assumes undivided responsibility for engineering cold-formed metal framing by employing a qualified professional engineer to prepare design calculations, shop drawings, and other structural data.

1.4 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 cold-formed metal framing, accessory, and product specified.
- C. Shop drawings showing layout, spacings, sizes, thicknesses, and types of cold-formed metal framing, fabrication, fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachments to other units of Work.
 - 1. For cold-formed metal framing indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for its preparation.
- D. Mill certificates signed by manufacturers of cold-formed metal framing certifying that their products comply with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, and galvanized-coating thickness.
 - 1. In lieu of mill certificates, submit test reports from a qualified independent testing agency evidencing compliance with requirements.
- E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- F. 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.
- G. Product test reports from a qualified independent testing agency evidencing compliance with requirements of the following based on comprehensive testing:
 - 1. Expansion anchors.
 - 2. Powder-actuated anchors.
 - 3. Mechanical fasteners.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel".
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.
- D. Fire-Test-Response Characteristics: Where fire-resistance-rated assemblies are indicated, provide cold-formed metal framing identical to that tested as part of an assembly 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 listed in UL "Fire Resistance Directory," or by Warnock Hersey or another testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Professional Engineer Qualifications: A professional engineer legally authorized to practice in the jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of cold-formed metal framing similar to this Project in material, design, and extent and that have a record of successful in-service performance.
- F. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section 01200 "Project Meetings", as needed by general contractor.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated in the Work include, but are not limited to, the following:
 1. Alabama Metal Industries Corp.
 2. American Studco, Inc.
 3. Clark-Cincinnati, Inc.
 4. Consolidated Fabricators Corp.
 5. Inco Plant Dale Industries.
 6. Knorr Steel Framing Systems.
 7. Super Stud Building Products, Inc.
 8. United States Steel.

2.2 MATERIALS

- A. Galvanized-Steel Sheet: ASTM A 446 zinc coated according to ASTM A 525 and as follows:
 1. Coating Designation: G 90 (Z 275).
 2. Grade: Grade A, 33,000-psi minimum yield strength, 20 percent elongation.
- B. Prime-Painted Steel Sheet: ASTM A 570 or ASTM A 611, cleaned, pretreated, and primed with manufacturer's baked-on, lead- and chromate-free, rust-inhibitive primer conforming to the performance requirements of FS TT-P-664.
 1. Grade: Grade 33 or Grade C, 33,000-psi minimum yield strength.

2.3 WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs of web depths indicated, with lipped flanges, and complying with the following:
 - 1. Design Uncoated-Steel Thickness and Flange width as indicated on drawings.
 - 2. Web: Punched.
- B. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:
 - 1. Design Uncoated-Steel Thickness: Matching steel studs, or as indicated on drawings.
 - 2. Flange Width: Manufacturers standard deep flange where indicated, standard flange elsewhere.

2.4 JOIST FRAMING

- A. Steel Joists: Manufacturer's standard C-shaped steel joists, unpunched, of web depths indicated, with lipped flanges, and complying with the following:
 - 1. Design Uncoated-Steel Thickness and Flange width as indicated on drawings.
- B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, unpunched, of web depths indicated, with straight flanges, and complying with the following:
 - 1. Design Uncoated-Steel Thickness and Flange width as indicated on drawings.

2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Gusset plates.
 - 5. Deflection track and vertical slide clips.
 - 6. Stud kickers and girts.
 - 7. Joist hangers and end closures.
 - 8. Reinforcement plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36, zinc coated by the hot-dip process according to ASTM A 123.
- B. Cast-in-Place Anchor Bolts and Studs: ASTM A 307, Grade A; carbon-steel hex-head bolts and studs; carbon-steel nuts; and flat, unhardened-steel washers. Zinc coated by the hot-dip process according to ASTM A 153.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E 488

conducted by a qualified independent testing agency.

- D. Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times the design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and a 30-minute working time.
- D. Thermal Insulation: ASTM C 665, Type I, unfaced mineral-fiber blankets produced by combining glass or slag fibers with thermosetting resins.

2.8 GYPSUM SHEATHING

- A. Sheathing: Comply with requirements of Division 7 Section 07241 "Exterior Insulation and Finish Systems--Class PB".
- B. Sheathing: Comply with requirements of Division 9 Section 09255 "Gypsum Board Assemblies."
- C. Gypsum Sheathing Board with Water-Resistant Core: Gypsum sheathing board consisting of noncombustible gypsum core incorporating a water-resistant material surfaced on face, back, and long edges with water-repellent paper bonded to the core. Comply with ASTM C 79 and requirements indicated below:
 - 1. Type: Regular.
 - 2. Type: Type X.
 - 3. Edge and End Configuration: V-shaped, tongue-and-groove long edges; square ends.
 - 4. Edge and End Configuration: Square.
 - 5. Thickness: 1/2 inch.
 - 6. Thickness: 5/8 inch.
 - 7. See drawings for applicability and locations of above.
- D. Available Products: Subject to compliance with requirements, gypsum sheathing boards that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Gypsum Sheathing Board with Water-Resistant Core, Regular Type:

- a. Gyproc Gypsum Sheathing; Domtar Gypsum Co.
 - b. G-P Gypsum Sheathing; Georgia-Pacific Corp.
 - c. Gold Bond Jumbo Gypsum Sheathing; National Gypsum Co., Gold Bond Building Products Div.
 - d. Gold Bond Regular Gypsum Sheathing; National Gypsum Co., Gold Bond Building Products Div.
 - e. USG Gypsum Sheathing; United States Gypsum Co.
2. Gypsum Sheathing Board with Water-Resistant Core, Type X:
- a. Gyproc Fireguard Sheathing; Domtar Gypsum Co.
 - b. G-P Firestop Sheathing; Georgia-Pacific Corp.
 - c. Gold Bond Fire Shield Jumbo Sheathing; National Gypsum Co., Gold Bond Building Products Div.
 - d. USG Firecode Type X Gypsum Sheathing; United States Gypsum Co.
3. Fiberock Sheathing Water-Resistant Core, Type X:
- a. USG Fiberock, Aquatough, Type X.
- E. Sheathing Fasteners: ASTM C 954, steel drill screws, Type S-12 fluted tip, a minimum of 1-1/4 inches long, with organic-polymer coating or other corrosion-protective coating.

2.9 TAPES AND SEALANT

- A. Sheathing Tape: Tape specifically designed and manufactured to seal joints in gypsum sheathing against water and air infiltration, formulated with an adhesive that permanently bonds to gypsum sheathing substrates, and as indicated below:
- 1. Linerless, polypropylene sheathing tape, 0.0027 inch thick, 2-1/2 inches wide, composed of oriented polypropylene backing coated with permanent acrylic adhesive formulated to adhere to gypsum sheathing surfaces.
 - 2. Polyethylene tape, 0.025 inch thick, 3 inches wide, composed of polyethylene backing coated with synthetic-rubber-based adhesive.
 - 3. Self-adhering, glass-fiber tape, 2 inches wide, 10-by-10 or 10-by-20 threads per inch, of type recommended by tape manufacturer to use with siliconized emulsion sealant in sealing joints and fasteners for gypsum sheathing, and with a history of successful in-service use.
 - 4. Available Products: Subject to compliance with requirements, sheathing tapes that may be incorporated in the Work include, but are not limited to, the following:
 - a. No. 8086 Contractor Sheathing Tape; 3M Construction Markets.
 - b. Perma-Tite Tape--PGM 207A; PermaGlass-Mesh, Inc.
 - c. POLYKEN 612 Seam Seal Tape; Polyken Technologies.
 - d. Quik-Tape; Quik-Tape, Inc.
- B. Silicone Emulsion Sealant: Product complying with ASTM C 834, compatible with sealant tape and gypsum sheathing, recommended by manufacturers of both sheathing and tape for use with glass-fiber sheathing tape and for covering exposed fasteners.

2.10 AIR-INFILTRATION BARRIER

- A. Provide one of the following products as indicated on drawings.
- 1. Woven polyolefin sheet, 0.005 inch thick, with a water-vapor transmission rate equaling 65 g

in 24 hours through 1 sq. m of surface per ASTM E 96 procedure A and a flame-spread rating not exceeding 25 per ASTM E 84.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Tyvek Housewrap; DuPont Company, Fibers Department.
2. Rufco-Wrap; Raven Industries, Inc.
3. Typar HouseWrap; Reemay, Inc.

2.11 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.

1. Fabricate framing assemblies in jig templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to cold-framed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to manufacturer's recommendations.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or distortion.

C. Fabrication Tolerances: Fabricate assemblies to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements, including installation tolerances and other conditions affecting performance of cold-formed metal framing. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed-on fireproofing is applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed-on fireproofing.

- B. After sprayed-on fireproofing has been applied, remove only as much fireproofing as needed to complete installation of cold-formed framing without reducing thickness of fireproofing below that required to obtain fire-resistance rating indicated. Protect remaining fireproofing from damage.
- C. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations, AISI's "Specification for the Design of Cold-Formed Steel Structural Members" and the requirements of this Section.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to cold-framed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
 - 3. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom track space studs as indicated by the drawings.
- C. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- D. Provide temporary bracing and leave in place until framing is permanently stabilized.
- E. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- F. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and double studs, inaccessible upon completion of framing work.
- G. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.
- H. Erection Tolerances: Install cold-formed metal framing to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 NONLOAD-BEARING CURTAINWALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

- B. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom track. Space studs as indicated on drawings.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Install horizontal bridging in curtainwall studs, spaced in rows not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Install additional row of horizontal bridging in curtainwall stud beneath deflection track when curtainwall studs are not fastened to an additional top track.
 - 2. Bridging: Cold-rolled steel channel, clip angle fastened to webs of punched studs.
 - 3. Bridging: Flat, steel-sheet straps of width and thickness indicated, fastened to stud flanges.
 - 4. Bridging: Combination of flat, steel-sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
- E. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtainwall-framing system.

3.5 RAFTERS/JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated or as recommended by the manufacturer.
- B. Install joists bearing on supporting framing, level, straight, and plumb, adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting framing with a minimum end bearing of 1-1/2 inches.
 - 2. Reinforce ends of joists with web stiffeners, end clips, joist hangers, steel clip angles, steel-stud sections, or as otherwise recommended by manufacturer.
- C. Space joists not more than 2 inches from abutting walls, and joist spacing as indicated on drawings.
- D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists where indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or by other method recommended by joist manufacturer.
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at each end of joists and at intervals indicated. Fasten bridging at each joist intersection as follows:
 - 1. Bridging: Cold-rolled steel channel, fastened to bottom flange of joists.
 - 2. Bridging: Flat, steel-sheet straps of width and thickness indicated, fastened to bottom flange of joists.
 - 3. Bridging: Combination of flat, steel-sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 TRUSS INSTALLATION

- A. Install, bridge, and brace trusses according to manufacturer's recommendations and requirements of this Section.
- B. Space trusses at centers indicated on drawings.
- C. Do not alter, cut, or remove framing members or connections of trusses.
- D. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.
- E. Erect trusses without damaging framing members or connections.
- F. Align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points.
- G. Install continuous bridging and permanently brace trusses.

3.7 GYPSUM SHEATHING INSTALLATION

- A. General: Install gypsum sheathing board according to manufacturer's instructions and GA-253 "Application of Gypsum Sheathing".
- B. Install tongue-and-groove gypsum sheathing horizontally with long edges at right angles to studs with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent board without forcing. Abut ends of boards over centers of studs and stagger end joints. Fasten gypsum sheathing board to framing with self-drilling, bugle-head screws, as follows:
- C. Install square end and edged sheathing vertically with long edges parallel to, and centered over, studs. Install solid blocking where end joints do not bear against framing sills or track. Fasten gypsum sheathing board to perimeter framing and to each stud with self-drilling, bugle-head screws, located a minimum of 3/8 inch from ends and edges of board units, as follows:
 - 1. Space fasteners to comply with manufacturer's recommendations.
 - 2. Space fasteners not more than 8 inches apart around perimeter at edge and end supports and 8 inches apart at intermediate supports.
 - 3. Space fasteners not more than 4 inches apart around perimeter at edge and end supports and 8 inches apart at intermediate supports.

3.8 TAPE AND SEALANT APPLICATION

- A. Sheathing Tape: Apply sheathing tape to joints in sheathing; overlap tape by not less than the tape width at joint intersections.
 - 1. For polyethylene tape, apply primer, specified by tape manufacturer, to sheathing surfaces. In addition, apply polyethylene tape, 2 inches square, to completely cover each exposed fastener.

2. For glass-fiber tape, apply approximately a 3/8-inch bead of siliconized emulsion sealant to tapes along joints and embed sealant into tapes along their entire surface with a trowel. In addition, apply sealant with a trowel to each exposed fastener so that fasteners are completely covered.

3.9 AIR-INFILTRATION BARRIER INSTALLATION

- A. Cover sheathing with air-infiltration barrier as indicated on drawings:

1. Apply woven polyolefin sheet according to manufacturer's printed recommendations with a 4-inch overlap.

3.10 FIELD QUALITY CONTROL

- A. At Architect's direction, field and shop welds may be subject to inspection and testing.
- B. If required, contractor will retain testing agency, which will report test results promptly and in writing to Contractor and Architect.
- C. Remove and replace Work that does not comply with specified requirements.
- D. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.11 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanizing repair paint according to ASTM A 780 and the manufacturer's instructions.
- B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing.
 1. Touchup painted surfaces with same type of shop paint used on adjacent surfaces.
- C. Protect gypsum sheathing that will be exposed to weather for more than one month as follows:
 1. Protect cutouts, corners, and joints in the sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at the time sheathing is applied.
- D. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer to ensure that cold-formed metal framing is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 05400

SECTION 05500 – METAL FABRICATIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Steel ladders.
 - 2. Loose bearing and leveling plates.
 - 3. Loose steel lintels.
 - 4. Shelf angles.
 - 5. Steel framing and supports for countertops.
 - 6. Steel framing and supports for mechanical and electrical equipment.
 - 7. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 8. Pipe bollards.
 - a. See drawings for applicable items.
- B. Related Sections include the following:
 - 1. Division 4 for lintel and shelf angle use.
 - 2. Division 6 for metal framing anchors and other rough hardware.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 2. Paint products.
 - 3. Grout.
- B. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 - 1. Provide templates for anchors and bolts specified for installation under other Sections.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel".

2. AWS D1.2, "Structural Welding Code--Aluminum".
3. AWS D1.3, "Structural Welding Code--Sheet Steel".
4. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.6 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 – PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- D. Rolled-Steel Floor Plate: ASTM A 786/A786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- E. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
- F. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
- G. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- H. Slotted Channel Framing: Cold-formed metal channels with flange edges returned toward web and with 9/16-inch wide slotted holes in webs at 2 inches o.c.
 1. Width of Channels: 1-5/8 inches.

2. Depth of Channels: As indicated.
 3. Metal and Thickness: Galvanized steel in exposed areas complying with ASTM A 653/A 653M, structural quality, Grade 33 (Grade 230), with G90 (Z275) coating; thickness as indicated.
 4. Metal and Thickness: Uncoated steel complying with ASTM A 570, Grade 33; thickness as indicated.
- I. Gray-Iron Castings: ASTM A 48, Class 30 (ASTM A 48M, Class 200), unless another class is indicated or required by structural loads.
 - J. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
 - K. Welded Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 ALUMINUM

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T6.
- B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, alloy 6061-T6.

2.4 PAINT

- A. Shop Primer for Ferrous Metal: Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat.
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carboline 621; Carboline Company.
 - b. Aquapon Zinc-Rich Primer 97-670; PPG Industries, Inc.
 - c. Tneme-Zinc 90-97; Tnemec Company, Inc.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FASTENERS

- A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36.

- D. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.
- G. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).
- H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).
- I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
- J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.6 GROUT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications, for exposed steel.

2.7 CONCRETE FILL

- A. Concrete Materials and Properties: Comply with requirements in Division 3 Section 03300 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.8 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Shear and punch metals cleanly and accurately. Remove burrs.
- C. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no

roughness shows after finishing and contour of welded surface matches that of adjacent surface.

- E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space-anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- J. Remove sharp or rough areas on exposed traffic surfaces.
- K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.9 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize exposed plates after fabrication.

2.10 LOOSE STEEL LINTELS

- A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches, unless otherwise indicated.
- D. Galvanize loose steel lintels located in exterior walls.

2.11 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than six inches from ends and 24 inches o.c., unless otherwise indicated.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and

concrete. Align expansion joints in angles with indicated control and expansion joints in cavity wall exterior wythe.

- C. Galvanize shelf angles to be installed in exterior walls.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.12 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.
- B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches wide by 1/4 inch thick by 8 inches long at 24 inches o.c., unless otherwise indicated.
 - 3. Furnish inserts if units must be installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.

2.13 THRESHOLDS

- A. See Division 8 Section 08710 "Finish Hardware."
- B. Drill for mechanical anchors and countersink. Locate not more than four inches from ends and not more than 12 inches o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.
 - 1. Provide two rows of holes for units more than five inches wide, with two holes aligned at ends and intermediate holes staggered.
- C. Apply bituminous paint to concealed bottoms, sides, and edges of units set into concrete.
- D. Provide a plain surface texture, unless fluted or crosshatched surfaces are indicated.
- E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Safety Tread Co., Inc.
 - 2. Amstep Products
 - 3. Armstrong Products, Inc.
 - 4. Balco/Metalines, Inc.
 - 5. Granite State Casting Co.
 - 6. Safe-T-Metal Co.
 - 7. Wooster Products, Inc.

2.14 PIPE BOLLARDS

- A. Fabricate pipe bollards from Schedule 40 steel pipe. See drawings for locations.

- B. Fabricate bollards with 3/8-inch thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts. (Utilize this anchoring method if drawings do not indicate anchoring through concrete.)
 - 1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.
- C. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch thick steel plate welded to bottom of sleeve.
- D. Fabricate internal sleeves for removable bollards from Schedule 40 steel pipe or 1/4-inch wall thickness steel tubing with an OD 1/16-inch less than ID of bollards. Match drill sleeve and bollard for 1/2-inch steel machine bolt.

2.15 STEEL LADDERS

- A. General: Fabricate ladders for locations shown, with dimensions, spacings, details, and anchorages as indicated.
 - 1. Comply with ANSI A14.3, unless otherwise indicated.
 - 2. For elevator pit ladders, comply with ASME A17.1.
- B. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges, spaced 16 inches apart.
- C. Bar Rungs: 3/4-inch- diameter steel bars, spaced 12 inches o.c.
- D. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
- E. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets. Size brackets to support design loads specified in ANSI A14.3.
- F. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Mebac; IKG Borden.
 - b. SLIP-NOT; W. S. Molnar Company.

2.16 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.17 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - 1. ASTM A 123, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum

requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning".
 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.18 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Bright, Directional Polish: No. 4 finish.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.19 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
- C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: Nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 SETTING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
1. Where grout space under bearing plates is indicated at girders supported on concrete or masonry, install as specified above for setting and grouting bearing and leveling plates.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified above for setting and grouting bearing and leveling plates.
1. Do not grout baseplates of columns supporting steel girders until girders are installed and leveled.

3.4 INSTALLING THRESHOLDS

- A. Install anchorage system indicated to comply with manufacturer's written instructions.
- B. Seal thresholds exposed to exterior with elastomeric sealant complying with Division 7 Section 07920 "Joint Sealants" to provide a watertight installation.

3.5 INSTALLING PIPE BOLLARDS

- A. Anchor bollards in concrete in formed or core-drilled holes not less than eight-inches deep and 3/4-inch greater than OD of bollard. After bollards have been inserted into holes, fill annular space

surrounding bollard solidly with nonshrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's written instructions. Slope grout approximately 1/8-inch towards bollard.

- B. Anchor internal sleeves for removable bollards in formed or core-drilled holes not less than eight-inches deep and 3/4-inch greater than OD of sleeve. After sleeves have been inserted into holes, fill annular space surrounding sleeves solidly with nonshrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8-inch toward sleeve.
- C. Fill bollards solidly with concrete, mounding top surface.
 - 1. Do not fill removable bollards with concrete.

3.6 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

SECTION 06105 – MISCELLANEOUS CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Framing with Dimension Lumber.
 - 2. Rooftop Equipment Bases and Support Curbs.
 - 3. Wood Furring, Grounds, Nailers, and Blocking.
 - 4. Sheathing.
 - 5. Interior Wood Trim.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 6 Section 06400 "Architectural Woodwork" for interior woodwork not specified in this Section.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. 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.
- C. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with performance requirements indicated.
- D. Warranty of chemical treatment manufacturer for each type of treatment.

1.4 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.
 - 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. NELMA - Northeastern Lumber Manufacturers Association.
 - 2. NLGA - National Lumber Grades Authority (Canadian).
 - 3. RIS - Redwood Inspection Service.
 - 4. SPIB - Southern Pine Inspection Bureau.
 - 5. WCLIB - West Coast Lumber Inspection Bureau.
 - 6. WWPA - Western Wood Products Association.
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
 - 1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece.
- D. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 1. Provide dressed lumber, S4S, unless otherwise indicated.
 - 2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

2.2 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 AWPAC2 (lumber) and AWPAC9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
- B. Pressure treat aboveground 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 sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing members less than 18 inches (460 mm) above grade.
 - 4. Wood floor plates installed over concrete slabs directly in contact with earth.
- C. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of 0.40 lb/cu. ft. (6.4 kg/cu. m).
- D. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

2.3 DIMENSION LUMBER

- A. General: Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.
- B. Miscellaneous Framing: Provide the following grades and species:
 - 1. Grade: No. 2.
 - 2. Species: Spruce-Pine-Fir South; NELMA.
 - 3. Species: Southern Pine; SPIB.
- C. Concealed Boards: Where boards will be concealed by other work, provide lumber with 19 percent maximum moisture content and of following species and grade:

2.4 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant 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 are 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.

2.5 INTERIOR STANDING AND RUNNING TRIM

- A. Softwood Trim: Provide finished lumber and moldings complying with the following requirements including those of the grading agency listed with species:
 - 1. Species: Eastern White Pine; NELMA or Idaho White, Lodgepole, Ponderosa, or Sugar Pine; WWPA.
 - 2. Species: Western Red Cedar; NLGA, WCLIB, or WWPA.
 - 3. Species: Douglas fir; NLGA, WCLIB, or WWPA.
 - 4. Grade: C & Btr. Finish, C Select, or Choice.
 - 5. Texture: Surfaces (Smooth).
 - 6. Lumber for Transparent Finish (Stained or Clear): Solid Lumber Stock.
 - 7. Lumber for Painted Finish: Glued-Up Lumber or Solid Lumber Stock.
- B. Hardwood Trim: Provide finished hardwood lumber and moldings complying with the following requirements:
 - 1. Species: Clear, Kiln-Dried White Hardwoods.
 - 2. Species and Cut: Rift-Sawn, Clear, Kiln-Dried Maple Selected for Compatible Grain and Color.
 - 3. Texture: Surfaced (Smooth).
 - 4. Lumber for Transparent Finish (Stained or Clear): Solid Lumber Stock.
 - 5. Lumber for Painted Finish: Glued-Up Lumber or Solid Lumber Stock.
 - 6. Provide Natural Clear Coat Sealed Hardwood Maple Interior Running Trim, 42-45 lbs./cu. ft., in Profiles and Sizes as Indicated on the Drawings.

2.6 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.
- B. Aliphatic- or phenolic-resin wood glue recommended by manufacturer for general carpentry use.

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 miscellaneous 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. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO NER-272.
- 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.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit 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.
- D. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.
- E. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
- F. Countersink nail heads on exposed carpentry work and fill holes with wood filler.
- G. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

- A. Install where shown and where required for screeding or attaching other work. Cut and shape to required size. Coordinate locations with other work involved.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.3 WOOD TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. 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.
 - 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 and fill holes.
 - 4. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for plumb and level. Install adjoining trim with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.6-mm) maximum offset for reveal installation.

END OF SECTION 06105

SECTION 06164 - GYPSUM SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: Fiberglass-mat faced, moisture and mold resistant gypsum sheathing.
- B. Related Sections:
 - 1. Section 06105 Miscellaneous Carpentry.
 - 2. Section 09255 Gypsum Board Assemblies.

1.3 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.
 - 2. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 3. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - 4. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - 5. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.
 - 6. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 - 7. ASTM D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers.
 - 8. ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
 - 9. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
 - 10. ASTM C1396 Standard Specification for Gypsum Board
 - 11. ASTM E 136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C
 - 12. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
- B. Gypsum Association (GA): GA-253 Application of Gypsum Sheathing.

1.4 SUBMITTALS

- A. Product Data: Manufacturer's specifications and installation instructions for each product specified.

1.5 WARRANTY

- A. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay) commencing with the date of installation of the product in such structure.
- B. Manufacturer's Warranty:

1. Five years against manufacturing defects from the date of purchase of the product for installation.
2. 12 years against manufacturing defects when used as a substrate in architecturally specified EIFS.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Georgia-Pacific Gypsum LLC:

1. Fiberglass-Mat Faced Gypsum Sheathing: DensGlass Sheathing.
2. Fiberglass-Mat Faced Gypsum Sheathing, Type X for Fire Rated Designs: DensGlass Fireguard Sheathing.

B. United States Gypsum:

1. Securock

C. National Gypsum:

1. eXP Sheathing

D. Certainteed:

1. Glasrock

2.2 MATERIALS

A. Fiberglass-Mat Faced Gypsum Sheathing: ASTM C1177:

1. Thickness: 1/2 inch.
2. Width: 4 feet.
3. Length: 8 feet
4. Weight: 1.9 lb/sq. ft.
5. Edges: Square.
6. Surfacing: Fiberglass mat on face, back, and long edges.
7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 540 pounds per square foot, dry.
8. Flexural Strength, Parallel (ASTM C473): 80 lbf, parallel.
9. Humidified Deflection (ASTM C1177): Not more than 2/8 inch.
10. Permeance (ASTM E96): Not less than 23 perms.
11. R-Value (ASTM C518): 0.56.
12. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
13. Microbial Resistance (ASTM D6329, UL Environmental GREENGUARD 3-week protocol): Will not support microbial growth.
14. Acceptable Products:

- a. 1/2 inch DensGlass Sheathing, Georgia-Pacific Gypsum LLC.

B. Fire-Rated Fiberglass-Mat Faced Gypsum Sheathing: ASTM C1177, Type X:

1. Thickness: 5/8 inch.
2. Width: 4 feet.

3. Length: 8 feet
4. Weight: 2.5 lb/sq. ft.
5. Edges: Square.
6. Surfacing: Fiberglass mat on face, back, and long edges.
7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 654 pounds per square foot, dry.
8. Flexural Strength, Parallel (ASTM C1177): 100 lbf, parallel.
9. Humidified Deflection (ASTM C1177): Not more than 1/8 inch.
10. Permeance (ASTM E96): Not less than 17 perms.
11. R-Value (ASTM C518): 0.67.
12. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
13. Microbial Resistance (ASTM D6329, UL Environmental GREENGUARD 3-week protocol): Will not support microbial growth.
14. Acceptable Products:
 - a. 5/8 inch DensGlass Fireguard Sheathing, Georgia-Pacific Gypsum LLC.

2.3 ACCESSORIES

- A. Screws: ASTM C1002, corrosion resistant treated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 1. Inspection: Verify that project conditions and substrates are acceptable, to the installer, to begin installation of work of this section.

3.2 INSTALLATION

- A. General: In accordance with GA-253, ASTM C1280 and the manufacturer's recommendations.
 1. Manufacturer's Recommendations:
 - a. Current "Product Catalog", Georgia-Pacific Gypsum.

3.3 PROTECTION

- A. Protect gypsum board installations from damage and deterioration until date of Substantial Completion.

END OF SECTION 06164

SECTION 06400 – ARCHITECTURAL WOODWORK (MILLWORK)

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

- A. Provide all labor, materials and equipment necessary for the complete installation of all wood and laminated millwork, countertops, backsplashes, filler panels, and miscellaneous items and accessories as shown on the drawings and specified herein.
- B. This work includes all modular unit increments of 1" in width. Special, custom and modified units may be furnished as an option.

1.3 WORK NOT INCLUDED

- A. Rubber or vinyl base, floors or ceiling, plumbing and electrical work at cabinetry.

1.4 QUALITY ASSURANCE

- A. Qualifications: The manufacturer shall be experienced in successfully producing architectural millwork similar to that indicate for this project for a period of not less than 5 years.
- B. Mock-Up: Submit one full-size cabinet mock-up, complete with one drawer, door and adjustable shelf, complete with all cabinet hardware. Mock-up accepted by the Architect is to remain on the job site as a standard of quality.
- C. Pre-Installation Conference: Schedule and convene a pre-installation conference prior to commencement of field operations, to establish procedures to maintain optimum working conditions, including storage and handling, and to coordinate and review interfacing of this work with related and adjacent work. Contractor shall notify Architect of conference date, time, and location and also verify receipt of approved shop drawings by installer prior to conference. Conference shall include the following attendees: Representatives for Owner, Architect, GC's project manager and site superintendent, installer's field superintendent, manufacturer's representative, and any other parties involved with preparation and installation of material and all accessories. Conduct conference at project site to comply with requirements in Division 1.

1.5 SUBMITTALS

- A. The millwork manufacturer shall furnish 6 sets of shop drawings giving all details and sizes, including methods of attachment and anything pertinent to the installation work, as soon as possible after the award of the contract. He shall include full specification requirements, including color samples of all finishes for the Architect's selection.
- B. Field Measurements: Check actual locations of walls and other construction for millwork fit. Provide accurate field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Where field measurements cannot be made without delaying the Work, guarantee dimensions with the Contractor and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimension correspond to guaranteed dimensions. Allow for trimming and fitting.

- C. The millwork manufacturer and supplier shall keep aware of the progress of the project and shall make sure that shop drawings are furnished in adequate time so that the millwork covered thereby can be fabricated and delivered in accordance with the schedule completion.

1.6 PRODUCT HANDLING

- A. Millwork shall not be delivered to project site until dry and heated storage space is provided. The millwork specified under this section is prefinished, and precaution must be taken to protect it against damage during installation and until final acceptance.
- B. Environmental Conditions: Obtain and comply with manufacturer's and installer's coordinated advice for optimum temperature and humidity conditions for millwork during storage and installation.
- C. Contractor shall be responsible for all quantities as shown on millwork layouts on drawings.

1.7 WARRANTIES AND GUARANTEES

- A. All millwork shall be guaranteed for a period of 5 years from manufacturer's defects and workmanship.

PART 2 – MATERIALS

2.1 MATERIALS

- A. Construction: AWI Custom Grade.
- B. Laminated Plastics/Finishes:
 - 1. High-pressure plastic laminate, GP-28 (0.028" nominal thickness), for exterior cabinet vertical surfaces.
 - 2. High-pressure plastic laminate, GP-28 (0.028" nominal thickness), for direct application to gypsum board substrates as indicated on the drawings.
- C. Color Selection Available:
 - 1. Textured finish vertical surface grade from Formica, Nevamar, or Wilsonart standard stock colors consisting of both wood grain patterns and solid colors; and premium metallic color as shown on drawings.
 - 2. Finish end panels will be same color as cabinet face from standard color selection.
 - 3. Direction of wood grain to be vertical on door end panels and exposed backs, horizontal on drawer faces, aprons and top rails.
 - 4. Edges: GP-50 (0.050" nominal thickness) or solid PVC edging machine-applied with hot melt adhesives.
 - 5. Semiexposed Surfaces: CL-20 or BK-20 or melamine.
 - 6. Thermoset Melamine Panels: Thermoset melamine resin impregnated decorative overlay permanently bonded to particleboard substrate.
 - a. Melamine Laminate: 9-11 mil. nominal thickness, 62% resin content, colorfast; complying with Standards of American Laminators Association (ALA) and NEMA LD3.
 - b. Approved manufacturers of melamine laminate include, but are not limited to:
 - 1) Masonite Corporation.
 - 2) Funder America, Inc.

- D. Plastic laminate balancing sheet: Colored CL-20 cabinet liner with textured surface to meet NEMA standards shall be used to balance door and drawer face and finished end face.
- E. Melamine Thermoset Decorative Panels (Pressure Fused Laminate):
 - 1. Decorative melamine resin impregnated laminate permanently bonded to substrate.
 - 2. The following agency requirements, standards and test shall apply:
 - a. American Laminators Association (ALA) 1985.
 - b. NEMA LD3-1985.
 - c. AWI standards, Grade: Custom grade.
 - 3. Melamine laminate for semi-exposed cabinet interiors behind doors and drawers and underside of wall cabinets.
 - 4. Wall cabinet bottoms to match interiors. Open cabinets shall be furnished color of face cabinets or if no available matching color use Plastic Laminate same color as exterior.
- F. Wood Finishes:
 - 1. Wood species and cut: Maple for exposed trim.
- G. Particleboard: Medium Density Particleboard formed of selected wood granules, compressed into sheets of specified thickness.
- H. Plywood: Exterior grade veneer core plywood for cabinet bases and counter top substrates. Cabinets to receive plumbing are to be constructed entirely of exterior grade plywood. Counter tops with solid surfacing shall be provided with exterior grade plywood substrate (if not completely solid surface material) as required for installation.
- I. Glue: Water resistant, with gluing done in clamps and jigs.

2.2 HARDWARE

- A. Hinges:
 - 1. Heavy duty, five knuckle 2 3/4" institutional type hinge. Mill ground, hospital tip, tight pin feature with all edges eased. Hinge to be full wrap around type of tempered steel .095 inch thick. Each hinge to have minimum nine screws, #7, 5/8" FHMS to assure positive door attachment.
 - 2. Two hinges per door to 36" in height. Three hinges per door to 70" in height and four hinges per door to 94" in height. Hinge to accommodate 13/16" thick plastic laminate door, and to allow 270-degree swing.
 - 3. Hinge finish to be dull chrome.
 - 4. Stanley #HT1592 or approved equivalent
- B. Pulls: Satin chrome 4" wire pull. Stanley #4484 Aluminum or approved equivalent.
- C. Catches: Magnetic catch for base and wall cabinets. Provide two 6 lb. Pull catches at each tall cabinet door (>48"). Stanley #SP41 Aluminum or approved equivalent.
- D. Drawer Slides:
 - 1. Standard Drawers: Epoxy powder coated to match drawer body color. Captive nylon rollers, both front and rear. Minimum 100 lb. Dynamic load rating and self-closing. Blum 230M or equivalent.

- E. Adjustable Shelf Supports: Double Pin locking device type to prevent accidental shelf slide off. Minimum 150 lb. load capacity each.
- F. Provide self-adhering clear resilient silencers/bumpers on all doors and drawers, typical.

2.3 DETAILED REQUIREMENTS FOR CABINET CONSTRUCTION

- A. General: Units shall be flush overlay construction.
- B. Cabinet Sub-Base: Exterior grade veneer core plywood (no cabinet body sides-to-floor).
- C. Cabinet Top and Bottom – Wall and Base:
 - 1. Cabinet bottoms to be architect selected colored melamine laminated $\frac{3}{4}$ " particleboard.
 - 2. Exterior exposed wall cabinet bottoms to match exterior of cabinet. Melamine laminate on inside of cabinet; if exposed interior, finish in melamine if color available or match exterior finish
 - 3. Leading exposed edges of cabinets to have 1 mm PVC.
- D. Cabinet Ends:
 - 1. Where not exposed, provide colored melamine laminate particleboard both sides, $\frac{3}{4}$ " thick. Holes drilled for adjustable shelves 1-1/4" on center.
 - 2. Exposed exterior cabinet end to be laminated with vertical grade plastic laminate and opposite side laminated with CL-20 colored cabinet liner.
 - 3. Leading exposed edges of cabinets to have 1 mm PVC.
- E. Fixed and Adjustable Shelves:
 - 1. Shelves inside base or wall cabinet shall be $\frac{3}{4}$ " particleboard with colored melamine both sides. Leading exposed edge of shelves to be edged with 1 mm PVC, to match interior.
 - 2. Storage Shelving, (as shown on Architectural drawings, shall meet the following criteria):
 - a. Solid wood (no composite press wood melamine, or particle board), shelves, edge glued to required shelf depths that will not deform (full $\frac{3}{4}$ " thick up to 30" width between verticals and 1" thick over 30" width).
 - b. $\frac{3}{4}$ " minimum thickness solid wood (no composite press wood melamine, or particle board), vertical supports drilled for 2 minimum shelf supports @ 32 mm O.C., typical.
 - c. Shelves to be fabricated for machined rabbet shelf pin keepers in line with the shelf pins on the underside of each end of each shelf board or screw-holes for "Knap & Vogt" # KV 345 or KV 346 steel shelf pins.
 - d. All exposed surfaces to be natural stain finish with "green" environmentally safe water based catalyzed lacquer material with clear chemical and scratch resistant properties.
 - e. All fasteners shall be covered with compatible wood "Fast Cap" or equivalent.
 - f. Each shelf unit section to be securely anchored to building structure with appropriate anchors to accommodate substrate material indicated/specified to resist overturning, buckling, and/or pull-out by fully loaded shelving sections.
 - g. All wood to be pressure treated when in contact with concrete or metal.
 - h. Wood floor nailers and toe kicks to be pressure treated if in contact with concrete and toe to be finished to match shelves.
 - i. Contractor's option to purchase and install 'Excalibur' Wood Shelving System as provided by "Palmetto Shelving Systems" 2391 Dutch Fork Road, White Rock, SC 29177, (803) 781-9955 or pre-approved equivalent, refer to Specification Section 01632 "Requests for Pre-Approvals".
- F. Cabinet Backs:

1. Standard cabinet back to be 1/2" thick, particleboard melamine for use on all cabinets with or without doors. Unexposed wall side of back to receive a continuous bead of elastic hot melt adhesive at joint between back and sides/top/bottom for sealing against moisture and further contribute to case rigidity.
2. Exposed exterior back to be 3/4" particleboard faced with high-pressure plastic laminate.

G. Doors and Drawer Fronts:

1. Plastic laminate doors and drawers fronts to be 3/4" thick for all hinged and sliding doors. Core material to be 3/4" thick, particleboard bonded on exterior with high-pressure laminate and with colored CL-20 cabinet liner on interior face. Drawer fronts and hinged doors are to overlay the cabinet body. Maintain a maximum 1/8" reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within the cabinet. Edges to be 3 mm PVC in manufacturer's stock colors.

H. Drawers:

1. Drawer fronts shall be applied to separate drawer body component sub-fronts.
2. Sides and back of drawers to be 3/4" thick colored melamine.
3. Exposed top edge to be 1 mm Flat Edge PVC. Color to match interior.
4. Drawer sides shall be doweled to receive front and back, machine squared and held under pressure while glued and pinned together.
5. Drawer bottom to be colored melamine laminate, 1/2" thick, housed and glued into front, sides and back. Underside of drawer to receive continuous bead of hot melt adhesive at joint between bottom, sides, front and back for sealing and rigidity.
6. All drawers shall have roller guides as specified.

- I. Door/Drawer Spreaders: Provide a minimum 3/4" x 4-1/2" x full width finished cabinet body spreaders immediately behind all door/drawer and multiple drawer horizontal joints to maintain exact body dimensions and close off reveal. Front edge to be 1 mm PVC.

- J. All exposed edges of substructures to be factory sealed with waterproof sealer. Field cuts to be sealed with Manufacturer's supplied brush on waterproof sealer.

2.4 ASSEMBLY

- A. All exposed exterior vertical surfaces with high-pressure plastic laminate, unless otherwise indicated.
- B. All parts machines for accurate fit and assembled with hardwood dowels and adhesives to result in true, square, level and plumb units.
- C. Verify dimensions of other trades to be built into millwork.
- D. End panels shall be doweled to receive bottom and top. Back panel shall be fully housed into cabinet sides, top and bottom to insure rigidity and a fully closed cabinet.
- E. Drawer bottom shall be fully housed into sides, back and subfront. Sides of drawer shall be doweled to receive drawer back, locked in fully to subfront, fastened with glue and mechanical fasteners.
- F. Rear of cabinet back and underside of drawer bottom joints to receive a continuous bead of hot melt adhesive to add to unit body strength and develop moisture seal.
- G. Scribe all tops and backsplashes to all other adjoining vertical surfaces.
- H. There will be a maximum scribe width of 2-1/2" at all cabinets abutting walls unless shown otherwise.

- I. Provide removable back panels and closure panels for plumbing access where shown on drawings or required for access to valves.
- J. Cabinet units to receive plumbing are to be constructed entirely of exterior grade plywood.

PART 3 – EXECUTION

3.1 COORDINATION

- A. Coordinate work of this section with related work of other sections as necessary to obtain proper installation of all items.
- B. Verify site dimensions of cabinet locations in building prior to fabrication.

3.2 INSTALLATION

- A. Shop drawings and installation instructions furnished by the manufacturer shall be strictly adhered to. Mechanics making the installation shall be experienced in this type work and capable of the highest quality of workmanship.
- B. Counter tops shall be installed flush against the wall. Provide clear sealant at top and around end of counter tops and cabinets where they meet wall surfaces and where counters have sinks and where required for sanitation. Sealant for cabinets and counter tops to be installed by cabinet contractor.
- C. The Contractor for the work of this section shall cut all openings in counter tops for sinks or other items required. Cut to size from template furnished by supplier of sinks or use sinks on job. Field-apply manufacturers supplied brush on sealant to all field cut work.
- D. The installer of the cabinetwork shall make use of scribe panels to fit cabinetwork into specific dimensions.

3.3 FIELD QUALITY CONTROL

- A. All defective workmanship or damaged components shall be corrected repaired or replaced, as requested by the Architect, without further cost to the Owner.
- B. General Contractor is responsible for protection of millwork from damage by other trades upon completion of installation by millwork supplier.

3.4 ADJUSTMENT

- A. Provide all door bumpers, drawer slides, etc., after installation to provide proper operation.
- B. Erect millwork straight, level and plumb and securely anchor in place. Field-adjust all drawer and door faces to plumb and level as required, with uniform space between faces.

3.5 CLEANING AND PROTECTION

- A. Exposed surfaces, edges drawer interiors and cabinet interiors shall be cleaned and all construction and installation marks removed prior to acceptance by Owner.
- B. Supplier of this equipment shall be responsible for the immediate removal and disposal of all trash, crating, etc.
- C. Protect millwork from damage until the completion of the project.

END OF SECTION 06400

SECTION 06611 - CAST MARBLE SOLUTIONS FOR SHOWER SURROUNDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes

- 1. Cast marble tub and shower panel systems, cast marble solutions for shower bases, with related accessories.

B. Related Sections

- 1. Section 06400 – Architectural Woodwork
- 2. Section 15400 – Plumbing - General

1.3 REFERENCES

- A. ANSI Z-124.1 - American National Standard for Plastic Fabrications; American National Standards Institute
- B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- C. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.

B. Product Data:

- 1. Manufacturer's printed product data indicating compliance with specified requirements.
- 2. Manufacturer's cleaning and maintenance data.

C. Shop Drawings:

- 1. Submit plans, elevations, and detail sections. Indicate overall dimensions, material thickness, location and size of cutouts, anchorage provisions and attachment methods. Indicate coordination requirements for adjacent and interfacing work.

- D. Selection Samples: For each product specified, provide color chips or booklet representing manufacturer's full range of available colors and patterns.

- E. Verification Samples: For each finish product specified, two samples, minimum size 4 inches square (100 mm), represent actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Member of International Cast Polymer Alliance (ICPA), with not less than five years of experience in manufacturing products similar to those required for this project.
- B. Installer Qualifications: Not less than five installations of comparable scope within the past three years.
 - 1. Provide list of contacts for recently completed projects.
 - 2. Architect may inspect installations and reject proposed installer on the basis of references or quality of work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cast marble materials until painting and similar operations that could damage the cast marble have been completed in installation areas.
- B. Packing and Shipping: Pack countertops, tub and shower surrounds, and other flat products in wooden crates to minimize shipping damage. Palletize other components.
- C. Check for shipping damage during unloading at site and notify manufacturer immediately of any obvious damage.
- D. Store products under shelter, off the ground, and protected from moisture. Materials must be at room temperature prior to installation. Handle products to prevent physical damage. Protect surfaces from staining, scratching, and other damage during handling and installation.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify shop drawings with field measurements prior to fabrication.
- B. Coordination: Coordinate construction activities of this section with construction activities specified in related sections.

1.8 WARRANTY

- A. Shower Panel Systems: Manufacturer's five-year limited warranty on defective materials.

PART 2 - PRODUCTS

2.1 CAST MARBLE MATERIAL

A. MANUFACTURES:

- 1. Intl Marble Industries, Inc 304 Bell Park Drive, Woodstock GA 30188 – Tel 770 928- 2252
Email: Sales@IMIToday.com (Basis of Design).
- 2. Pre-Approved Easton Industries, 550 Piedmont Ave, Myrtle Beach, SC 29577, Tel (843) 448-2354.

- B. Or prior Pre-Approval per Section 01632.

C. SHOWER SURROUNDS

1. Material: IMIProCast™ panels, Class A per ASTM E 84, with properties as follows per ASTM E 84: Flame Spread: 25 or less.
Smoke Developed: 450 or less.

D. Shower Bases and Shower Pans

1. Material: Manufacturer's IMISolidCast™ standard cast marble material.
 2. Configuration: One piece shower receptor with integral curbs.
 3. Refer to plan to verify shower base sizes required as dimensioned.
 4. Provide maximum 1/2" high curb or flush roll-in edge base receptors to comply with ANSI 117.1 / ADA requirements for at all handicapped shower units indicated on plan.
 5. Coordinate drain outlet locations and sizes with the plumbing plans.
- E. Color and Pattern: As selected from manufacturer's standards. See Website or call for project specific spec sheets.

2.2 INSTALLATION

- A. All substrates must be properly prepared. If substrate preparation is the responsibility of another installer, notify the General Contractor or Architect of unsatisfactory preparation before proceeding.
- B. Request manufacturer's instructions and approved shop drawings before installation. Install components to be plumb, level, and rigid. Neatly scribe to adjoining surfaces, and field trim as required for snug fit. Replace any component that is cracked, chipped, broken, or otherwise defective.
- C. Tub and Shower Panel System: Cut openings as required for installation of plumbing fittings. Secure soap dishes to panels with silicone joint sealer, as recommended by panel manufacturer.
- D. Adhesives and Sealants: As specified in Section 07920, and as follows:
1. To adhere cast marble panels to gypsum wallboard, use TiteBond Franklin7272, LN-933 Liquid Nails, or other product recommended by manufacturer.
 2. For joints between cast marble panels, use a mildew resistant 100 percent silicone joint sealer such as Sil Bond 4500 High Strength Silicone Sealant by IMI; siliconized acrylic caulking compound is not acceptable.
 3. For sealing cast marble panels at adjoining surfaces such as gypsum wallboard, use mildew resistant latex caulk joint sealer, such as Peri Bond 3 by IMI or other product recommended by cast marble panel manufacturer.

2.3 FABRICATION

- A. Use molds materials, methods, and procedures that will result in proper texture and finish.
- B. Fabricate to required profiles and dimensions. Wherever possible, fabricate each unit as a continuous piece, without joints, while minimizing on-site cutting or other modifications.
- C. Hand sand all edges smooth; provide uniform finish on all exposed surfaces.
- D. Label each side panel to identify finished edges for ease of install. i.e. ^ Left Hand Side Panel Finished Edge and Right-Hand Side Panel Finished Edge.

PART 3 - EXECUTION

3.1 PREPARATIONS

- A. Store cast marble to room temperature (65 degrees or above) before handling.

3.2 INSTALLATION

- A. All panel systems to be installed as shown on Shop Drawings and as specified by mfg.
 - 1. Install components plumb, level and tightly to substrate. Scribe to adjacent finishes.
 - 2. Remove all dust and other contaminants from back of panels.
 - 3. Do not use water or denatured alcohol to clean back of panel. Use dry cloth.

3.3 CLEANING

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

END OF SECTION 06611

SECTION 06651 - SOLID SURFACE FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following horizontal and trim solid surface product types:
 - 1. Countertops
 - 2. Windowsills
 - 3. Cove backsplashes and sidesplashes
- B. Related Sections include the following:
 - 1. Division 5 Section 05500 "Metal Fabrications" for Blocking.
 - 2. Division 6 Section 06105 "Miscellaneous Carpentry" for Blocking.
 - 3. Division 6 Section 06400 "Architectural Woodwork (Millwork)".
 - 4. Division 15 Section 15400 "Plumbing General".
 - 5. Division 16 Section 16010 "General Electrical Requirements" for interior wiring systems.

1.3 DEFINITION

- A. Solid surface is defined as nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

1.4 SUBMITTALS

- A. Product Data:
 - 1. For each type of product indicated.
 - 2. Product data for the following:
- B. Shop Drawings:
 - 1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
 - a. Show full-size details, edge details, thermoforming requirements, attachments, etc.
 - b. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
 - c. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in solid surface.
- C. Samples:
 - 1. For each type of product indicated.
 - a. Submit minimum 6-inch by 6-inch sample in specified gloss.
 - b. Cut sample and seam together for representation of inconspicuous seam.

- c. Indicate full range of color and pattern variation.
 - 2. Approved samples will be retained as a standard for work.
 - D. Product Data:
 - 1. Indicate product description, fabrication information and compliance with specified performance requirements.
 - E. NSF/ANSI standards:
 - 1. Refer to www.nsf.org for the latest compliance to NSF/ANSI Standard 51 for food zone - all food types.
 - F. Maintenance Data:
 - 1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
 - a. Maintenance kit for finishes shall be submitted.
 - 2. Include in project closeout documents.
- 1.5 QUALITY ASSURANCE
- A. Qualifications:
 - 1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.
 - B. Fabricator/installer qualifications:
 - 1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.
 - C. Applicable standards:
 - 1. Standards of the following, as referenced herein:
 - a. American National Standards Institute (ANSI).
 - b. American Society for Testing and Materials (ASTM).
 - c. National Electrical Manufacturers Association (NEMA).
 - d. NSF International.
 - 2. Fire test response characteristics:
 - a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1) Flame Spread Index: 25 or less.
 - 2) Smoke Developed Index: 450 or less.
 - D. Coordination Drawings:

1. Shall be prepared indicating:
 - a. Plumbing work.
 - b. Electrical work.
 - c. Miscellaneous steel for the general work.
 - d. Indicate location of all walls (rated and non-rated), blocking locations and recessed wall items, etc.
2. Content:
 - a. Project-specific information, drawn accurately to scale.
 - b. Do not base coordination drawings on reproductions of the contract documents or standard printed data.
 - c. Indicate dimensions shown on the contract drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements.
 - d. Provide alternate sketches to designer for resolution of such conflicts.
 - 1) Minor dimension changes and difficult installations will not be considered changes to the contract.

E. Drawings Shall:

1. Be produced in 1/2-inch scale for all fabricated items.

F. Drawings must be complete and submitted to the architect within 60 days after award of contract for record only.

1. No review or approval will be forthcoming.
2. Coordination drawings are required for the benefit of contractor's fabricators/installers as an aid to coordination of their work so as to eliminate or reduce conflicts that may arise during the installation of their work. Installer/fabricator shall be responsible for conducting and verifying their own field measurements for existing conditions prior to shop drawing development and coordination of schedule with the general contractor.

G. Job Mock-Up:

1. Prior to fabrication of architectural millwork, erect sample unit to further verify selections made under sample submittals and to demonstrate the quality of materials and execution.

H. Pre-Installation Conference:

1. Schedule and convene a pre-installation conference prior to commencement of field operations, to establish procedures to maintain optimum working conditions, including storage and handling, and to coordinate and review interfacing of this work with related and adjacent work. Contractor shall notify Architect of conference date, time, and location and also verify receipt of approved shop drawings by installer prior to conference. Conference shall include the following attendees: Representatives for Architect, GC's project manager and site superintendent, installer's field superintendent, manufacturer's representative, and any other parties involved with preparation and installation of material and all accessories. Conduct conference at project site to comply with requirements in Division 1.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation.

- B. Store components indoors prior to installation.
- C. Handle materials to prevent damage to finished surfaces.
 - 1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.7 Warranty

- A. Provide manufacturer's warranty against defects in materials.
 - 1. Warranty shall provide material and labor to repair or replace defective materials.
 - 2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.
 - 3. Provide copy of sample warranty with shop drawing submittals that reflects final warranty to be issued at project "close-out" for review and approval by Architect and Owner.

1.8 MAINTENANCE

- A. Provide maintenance requirements as specified by the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers:
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. Corian® surfaces from the DuPont company (basis of design).
 - b. Wilson Art.
 - c. Avonite.
 - d. Or approved equivalent per Section 01632 "Requests for Pre-Approvals".

2.2 MATERIALS

- A. Solid polymer components
 - 1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
 - 2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.
- B. Thickness:
 - 1. 1/2 inch.
- C. Edge treatment:
 - 1. As indicated on drawings.
- D. Backsplash:

1. As indicated on drawings.

E. Sidesplash:

1. Applied.

F. Performance Characteristics:

Property	Typical Result	Test
Tensile Strength	6,000 psi	ASTM D 638
Tensile Modulus	1.5×10^{-6} psi	ASTM D 638
Tensile Elongation	0.4% min.	ASTM D 638
Flexural Strength	10,000 psi	ASTM D 790
Flexural Modulus	1.2×10^{-6} psi	ASTM D 790
Hardness	>85	Rockwell "M" Scale
	56	ASTM D 785 Barcol Impressor
Thermal Expansion	3.02×10^{-5} in./in./°C (1.80×10^{-5} in./in./°F)	ASTM D 2583 ASTM D 696
Gloss (60° Gardner)	5–75 (matte—highly polished)	ANSI Z124
Light Resistance	(Xenon Arc) No effect	NEMA LD 3-2000 Method 3.3
Wear and Cleanability	Passes	ANSI Z124.3 & Z124.6
Stain Resistance: Sheets	Passes	ANSI Z124.3 & Z124.6
Fungus and Bacteria Resistance	Does not support microbial growth	ASTM G21&G22
Boiling Water Resistance	No visible change	NEMA LD 3-2000 Method 3.5
High Temperature Resistance	No change	NEMA LD 3-2000 Method 3.6
Izod Impact (Notched Specimen)	0.28 ft.-lbs./in. of notch	ASTM D 256 (Method A)
Ball Impact	No fracture—1/2 lb. ball:	NEMA LD 3-2000
Resistance: Sheets	1/4" slab—36" drop 1/2" slab—144" drop	Method 3.8
Weatherability	$\Delta E^*_{94} < 5$ in 1,000 hrs.	ASTM G 155
Specific Gravity †	1.7	
Water Absorption	Long-term 0.4% (3/4") 0.6% (1/2") 0.8% (1/4")	ASTM D 570
Toxicity	99 (solid colors) 66 (patterned colors)	Pittsburgh Protocol Test ("LC50" Test)
Flammability	All colors (Class I and Class A)	ASTM E 84, NFPA 255 & UL 723
Flame Spread Index	<25	
Smoke Developed Index	<25	

† Approximate weight per square foot: 1/4" (6 mm) 2.2 lbs., 1/2" (12.3 mm) 4.4 lbs.
Shapes meet or exceed the ANSI Z124.3 and ANSI Z124.6 standards for plastic sinks and lavatories.

NEMA results based on the NEMA LD 3-2000.

- G. See drawings for sizes, thicknesses and application locations.

2.3 ACCESSORIES

A. Joint adhesive:

1. Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.

B. Sealant:

1. Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone - any type), UL-listed silicone sealant in colors matching components.

C. Sink / Lavatory Mounting Hardware:

1. Manufacturer's standard bowl clips, panel inserts and fasteners as required for attachment of drop-in (deck mounted) stainless steel sinks and under mounted stainless steel sinks, coordinate and verify with the plumbing drawings.
2. Integral Sink Bowls: Comply with ISSFA-2 and ANSI Z124.3, Type 5 or Type 6, without a precoated finish.

D. Conductive Tape:

1. Manufacturer's standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.

E. Insulating Felt Tape:

1. Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat source.

2.4 FACTORY FABRICATION

A. Shop Assembly:

1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
 - a. Reinforce with strip of solid polymer material, 2" wide.
3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
4. Rout and finish component edges with clean, sharp returns.
 - a. Rout cutouts, radii and contours to template.
 - b. Smooth edges.
 - c. Repair or reject defective and inaccurate work.

2.5 FINISHES

- A. Provide manufacturer's color selections based on "Corian's" Grade Level "D" or higher. Color and pattern choices to be submitted to Architect for review and final approval. Refer to Specification Section 01300 "Submittals" for outline of submittal process.
- B. Finish:
 - 1. Provide surfaces with a uniform finish.
 - a. Semigloss; Gloss range of 20–50.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data. Counter tops as indicated on drawings shall be mounted in accordance to meet minimum requirements of the Americans with Disability Act (ADA).
 - 1. Provide product in the largest pieces available.
 - 2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
 - a. Exposed joints/seams shall not be allowed.
 - 3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
 - 4. Cut and finish component edges with clean, sharp returns.
 - 5. Rout radii and contours to template.
 - 6. Anchor securely to base cabinets or other supports.
 - 7. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
 - 8. Carefully dress joints smooth, remove surface scratches and clean entire surface.
 - 9. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.
- B. Coved backsplashes and applied sidesplashes:
 - 1. Install applied sidesplashes using manufacturer's standard color-matched silicone sealant.
 - 2. Adhere applied sidesplashes to countertops using manufacturer's standard color-matched silicone sealant.
- C. Coved backsplashes and sidesplashes:
 - 1. Provide coved backsplashes at all walls and adjacent millwork.
 - 2. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on the drawings.

3. Adhere to countertops using manufacturer's standard color-matched Joint Adhesive.

D. Sinks:

1. Secure stainless steel sinks to top or to bottom of counter tops using manufacturer's recommended sealant, adhesive and mounting hardware to maintain warranty.
2. Integral Sink Bowls: Comply with ISSFA-2 and ANSI Z124.3, Type 5 or Type 6, without a precoated finish.

3.3 REPAIR

- A. Replace damaged work, which cannot be repaired to Architect's and/or Owner's satisfaction.

3.4 CLEANING AND PROTECTION

- A. Keep components clean during installation.
- B. Remove adhesives, sealants and other stains.
- C. Review and provide demonstrations per manufacturer's recommendations for maintaining, cleaning, and repairs with Owner's representative(s).
- D. Refer to Specification Section 01710 "Final Cleaning" requirements.

END OF SECTION 06651

SECTION 07115 – BITUMINOUS DAMPPROOFING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes :
 - 1. Cold-applied, cut-back asphalt dampproofing.
 - 2. Cold-applied, emulsified-asphalt dampproofing.

1.3 SUBMITTALS

- A. Product Data: For each product indicated.

1.4 PRE-INSTALLATION CONFERENCE:

- A. Product and installation work shall be reviewed during foundation and masonry pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Approved manufacturer's data submittal shall be available on site during pre-installation conference.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following.

2.2 BITUMINOUS DAMPPROOFING

- A. Cold-Applied, Cut-Back (Solvent-Based) Asphalt Dampproofing:
 - 1. Trowel Coats: ASTM D 4586, Type I, Class 1, fibered.
 - 2. Roller or Brush Coats: ASTM D 4479, Type I, fibered.
 - 3. VOC Content: 2.5 lb/gal. (300 g/L), 4.2 lb/gal. (500 g/L).
 - 4. Manufacturers:
 - a. Karnak Corporation.
 - b. Koppers Industries, Inc.
 - c. Meadows, W. R., Inc.
 - d. Sonneborn, Div. of ChemRex, Inc.
 - e. ChemMasters Corp.
 - f. Degussa Building Systems; Sonneborn Brand Products.
 - g. Gardner Gibson, Inc.
 - h. Henry Company.
 - i. Malarkey Roofing Products.
 - j. Tamms Industries, Inc.

B. Cold-Applied, Emulsified - Asphalt Dampproofing:

1. Trowel Coats: ASTM D 1227, Type II, Class 1.
2. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
3. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.
4. VOC Content: Zero, 0.25 lb/gal. (30 g/L) or less.
5. Manufacturers:
 - a. ChemMasters Corp.
 - b. Degussa Building Systems; Sonneborn Brand Products.
 - c. Gardner Gibson, Inc.
 - d. Henry Company.
 - e. Karnak Corporation.
 - f. Koppers, Inc.
 - g. Malarkey Roofing Products.
 - h. Meadows, W. R., Inc.
 - i. Tamms Industries, Inc.

2.3 MISCELLANEOUS MATERIALS

- A. Cut-Back Asphalt Primer: ASTM D 41.
- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.
- C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

PART 3 - EXECUTION

3.1 APPLICATION, GENERAL

- A. Clean substrates of projections and substances detrimental to work, form fins should be rubbed off and voids, rock pockets and form tie depressions should be filled with mortar and troweled smooth and flush; rough or porous masonry below grade should be given a cement mortar parge coat as required, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.
- B. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
- C. Apply dampproofing to footings and foundation walls from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches over outside face of footing.
 1. Apply from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches (150 mm) over outside face of footing
 2. Extend 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat required for embedding fabric is in addition to other coats required.
- D. Apply dampproofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.

3.2 COLD-APPLIED, CUT-BACK ASPHALT DAMPPROOFING

- A. On Concrete Foundations: Apply two roller or brush coats at not less than 1.25 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, or one trowel coat at not less than 4 gal./100 sq. ft.
- B. On Backs of Concrete or Masonry Retaining or Planter Walls: Apply one roller or brush coat at not less than 1.5 gal./100 sq. ft.
- C. On Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one roller or brush coat at not less than 1.5 gal./100 sq. ft.

3.3 COLD-APPLIED, EMULSIFIED ASPHALT DAMPPROOFING

- A. On Concrete Foundations and Parged Masonry Foundation Walls: Apply 2 brush or spray coats at not less than 1.5 gal./100 sq. ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat, 1 fibered brush or spray coat at not less than 3 gal./100 sq. ft. (1.2 L/sq. m), or 1 trowel coat at not less than 4 gal./100 sq. ft. (1.6 L/sq. m).
- B. On Unparged Masonry Foundation Walls: Apply primer and 1 trowel coat at not less than 5 gal./100 sq. ft. (2 L/sq. m).
- C. On Unexposed Face of Concrete Retaining Walls: Apply 1 brush or spray coat at not less than 1.25 gal./100 sq. ft. (0.5 L/sq. m).
- D. On Unexposed Face of Masonry Retaining Walls: Apply primer and 1 brush or spray coat at not less than 1.25 gal./100 sq. ft. (0.5 L/sq. m).
- E. On Exterior Face of Inner Wythe of Cavity Walls: Apply primer and 1 brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).
- F. On Interior Face of Exterior Concrete Walls: Where above grade and indicated to be furred and finished, apply 1 brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

3.4 PROTECTION AND CLEANING

- A. Protect exterior, below-grade dampproofing membrane from damage until backfill is completed. Remove overspray and spilled materials from surface not intended to receive dampproofing.

END OF SECTION 07115

SECTION 07190 – WATER REPELLENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes clear water-repellent coatings for the following vertical surfaces:
 - 1. Brick Masonry.
 - 2. Custom Concrete Masonry Units.

1.3 SUBMITTALS

- A. Product Data: For each product indicated, including test reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer (applicator) who employs only persons trained and approved by manufacturer to apply manufacturer's products.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which Installer agrees to repair or replace water-repellent coatings that fails in materials and workmanship within **five** years from date of Substantial Completion. Warranty does not include deterioration or failure of coating due to unusual weather phenomena, failure of prepared and treated substrate, new substrate cracks in excess of 1/16 inch wide, fire, vandalism, or abuse by maintenance equipment.

PART 2 – PRODUCTS

2.1 WATER REPELLENTS

- A. Sure Klean® Weather Seal Siloxane WB Concentrate by Prosoco, Inc. for vertical application, in above grade masonry surfaces.

PART 3 – EXECUTION

3.1 APPLICATION

- A. Preparation: Clean substrate of substances that might interfere with penetration or performance of water repellents. Before applying, read "Preparation" and "Safety Information" sections in the Manufacturer's Product Data Sheet for Weather Seal Siloxane WB Concentrate. Refer to the Product Data Sheet for additional information about application and dilution rates of Weather Seal Siloxane WB Concentrate.

- B. Weather and Substrate Conditions: Do not proceed with application of water repellent under any of the following conditions, except with written instruction of manufacturer:
1. Surface and air temperature is less than 40 deg F and will be less than 40 deg F for 8 hours following application.
 2. Mortar has cured for less than 28 days.
 3. Rain or temperatures below 40 deg F are predicted within 24 hours.
 4. Surface and air temperature is greater than 90 deg F.
 5. Windy condition exists that may cause water repellent to be blown onto vegetation or surfaces not intended to be coated.
- C. Protect adjoining work, including sealant bond surfaces, people, vehicles, property, plants, windows, aluminum, and all other surfaces not set for treatment from product, from spillage, splash, residue, fumes or blow-over of water repellent. Use polyethylene or other tested material for protecting non-masonry surfaces.
- D. Coordination with Sealants: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the Work.
- E. Test Application: Before performing water-repellent work, including bulk purchase and delivery of products, apply to sample panel per Manufacturer's instructions to demonstrate final effect (visual, physical, and chemical) of planned application. Proceed with work only after Architect approves test application or as otherwise directed.
- F. Comply with Manufacturer's written instructions for application methods and coverage rates.
- G. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Repair damage caused by water-repellent application. Comply with manufacturer's written cleaning instructions.
- H. After application is complete, remove protective coverings from adjacent surfaces and other protected areas.

END OF SECTION 07190

SECTION 07210 – BUILDING INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Concealed Building Insulation.
 - 2. Safing Insulation.
 - 3. Vapor Retarders (Barriers).
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 07510 "Metal Building Roof Insulation".
 - 2. Section 13125 "Metal Building Systems".

1.3 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.

1.4 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. 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.

1.5 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.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide insulation products by one of the following:
 - 1. Glass-Fiber Blanket Insulation:
 - a. CertainTeed Corporation.
 - b. Guardian Fiberglass, Inc.
 - c. Johns Manville.
 - d. Knauf Fiber Glass.
 - e. Owens Corning.

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. Faced Mineral-Fiber Blanket Insulation: Thermal insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 (flame spread of 25 or less) with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on 1 face.
 - 1. Mineral-Fiber Type: Fibers manufactured from glass, slag wool, or rock wool.
 - 2. Flanged Units: Provide blankets fabricated with facing incorporating 5-inch wide flanges along edges for attachment to framing members.
 - 3. Provide building insulation as follows:
 - a. Exterior Walls: R-19 insulation (total system including vinyl backed building insulation).
 - b. Roof 9: R-30 insulation (total system including vinyl backed building insulation).

Note: These "R" values shall take precedence over insulation values as noted throughout other specification sections and details of the Contract Documents.

2.3 VAPOR RETARDERS

- A. Polyethylene Vapor Retarder: ASTM D 4397, 6 mils (0.15 mm) thick, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).

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.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
- C. Set reflective, foil-faced units with not less than 0.75-inch air space in front of foil as indicated.
- 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.
- E. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.5 INSTALLATION OF VAPOR RETARDERS

- A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping not less than 2 wall studs. Fasten vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
- B. Seal overlapping joints in vapor retarders with adhesives or vapor-retarder tape according to vapor retarder manufacturer's instructions. Seal butt joints and fastener penetrations with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
- D. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.

- E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
- F. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

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 07210

SECTION 07241 – EXTERIOR INSULATION AND FINISH SYSTEMS – CLASS PB

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Class PB Exterior insulation and finish system (EIFS) with waterproofed openings and source drainage at floor line expansion joints and exposed opening head conditions over concrete.
 - 2. Class PB Exterior insulation and finish system (EIFS) with waterproofed openings and source drainage at floor line expansion joints and exposed opening head conditions over masonry.

1.3 RELATED SECTIONS

- A. Coordinate the work of this Section with related work include in other Section.
 - 1. Section 03300 "Cast-in-Place Concrete".
 - 2. Division 4 Section 04220 "Concrete Masonry Units".
 - 3. Section 07620 "Sheet Metal Flashing and Trim".
 - 4. Section 07920 "Joint Sealants".

1.4 DEFINITIONS

- A. Exterior Insulation and Finish System (EIFS): Exterior assembly comprised of Adhesive, rigid insulation, Base Coat, Reinforcing Mesh, and Finish Coat.
- B. Class PB Systems: A class of EIFS where the Base Coat varies in thickness depending upon the number of layers or thickness of Reinforcing Mesh. The reinforcing material is glass fiber mesh, which is embedded into the Base Coat at the time of installation. The Base Coat shall be applied so as to achieve Reinforcing Mesh embedment with no Reinforcing Mesh color visible, nominal thickness of 1.6 mm (1/16"). Protective Finish Coats, of various thicknesses, in a variety of textures and colors, are applied over the Base Coat.
- C. Flashed Opening Design: Water-managed Class PB EIFS incorporating flashing and weather barriers to redirect incidental moisture to the exterior from containment points around windows, doors, other penetrations, and at floor line expansion joints.

1.5 PERFORMANCE REQUIREMENTS

- A. General: Provide systems that comply with the following performance requirements:
 - 1. Bond Integrity: Free from bond failure within system components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
 - 2. Weathertightness: Resistant to water penetration from exterior into system and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of system and assemblies behind it, including substrates, supporting wall construction, and interior finish. Must comply with ASTM D2247

and ASTM E331. System shall have no visible penetration after 15 minutes of exposure at 6.24 psf.

B. Physical Properties of Class PB System: Provide EIFS whose physical properties and structural performance comply with the following when tested per methods referenced:

1. Abrasion Resistance: Sample consisting of 1-inch- (25.4-mm-) thick EIFS mounted on 1/2-inch - (12.7-mm-) thick gypsum board; cured for a minimum of 28 days; and showing no cracking, checking, or loss of film integrity after exposure to 528 quarts (500 L) of sand when tested per ASTM D 968, Method A.
2. Accelerated Weathering Characteristics: Sample of size suitable for test equipment and consisting of 1-inch- (25.4-mm-) thick EIFS mounted on 1/2-inch- (12.7-mm-) thick gypsum board; cured for 28 days; and showing no cracking, checking, crazing, erosion, blistering, peeling, or delamination after testing for 5000 hours when viewed under five times magnification per the following:
 - a. ASTM G 155.
3. Absorption-Freeze Resistance: No visible deleterious effects and negligible weight loss after 60 cycles per EIMA 101.01.
4. Mildew Resistance: Sample consisting of finish coat applied to 2-by-2-inch (50.8-by-50.8-mm) clean glass substrate; cured for 28 days; and showing no growth when tested per ASTM D 3273.
5. Salt-Spray Resistance: Sample consisting of 1-inch- (25.4-mm-) thick EIFS mounted on 1/2-inch- (12.7-mm-) thick gypsum board; cured for 28 days; and showing no cracking, checking, crazing, erosion, blistering, peeling, or delamination after testing for 300 hours per ASTM B 117.
6. Tensile Adhesion: No failure in the adhesive, base coat, or finish coat. Minimum 5-psi (34.5-kPa) tensile strength before and after freeze-thaw and accelerated weathering tests per ASTM C297 and EIMA 101.03.
7. Water Penetration: Sample consisting of 1-inch- (25.4-mm-) thick EIFS mounted on 1/2-inch- (12.7-mm-) thick gypsum board; cured for 28 days; and showing no water penetration into the plane of the base coat to expanded polystyrene board interface of the test specimen after 15 minutes at 6.24 lbf/sq. ft. (299 Pa) of air pressure difference or 20 percent of positive design wind pressure, whichever is greater, across the specimen during a test period when tested per EIMA 101.02. Must comply with ASTM E331.
8. Water Resistance: Sample consisting of 1-inch- (25.4-mm-) thick EIFS mounted on 1/2-inch- (12.7-mm-) thick gypsum board; cured for 28 days; and showing no cracking, checking, crazing, erosion, blistering, peeling, or delamination after testing for 14 days per ASTM D 2247.
9. Impact Resistance: Sample consisting of 1-inch- (25.4-mm-) thick EIFS when constructed, conditioned, and tested per EIMA 101.86; and meeting or exceeding the following impact classification and range:
 - a. Medium impact resistance 50-89 in-lb (6-10 J).
 - b. High Impact Resistance: 90-150 inch-lb (10.2-17 J). Install in all areas up to 8'0" AFF.
 - c. See drawings for locations of standard and high impact resistance.
10. Positive and Negative Wind-Load Performance: Sample assembly, 48 by 96 inches (1220 by 2438 mm) in size, consisting of studs, sheathing, and 1-inch- (25.4-mm-) thick EIFS; and showing capability to withstand wind loads indicated when tested per ASTM E 330.
11. EIFS manufacturer shall provide recommendation for proper system attachment of EIF system to substrates other than CMU or concrete.

1.6 SUBMITTALS

- A. Product Data: For each component of EIFS specified.
- B. Shop Drawings: Show fabrication and installation of system including plans, elevations, sections, details of components, joint locations and configurations within system and between system and construction penetrating it, termination details, and attachments to construction behind system.
- C. Samples for Initial Selection: Manufacturer's color charts and small-scale samples consisting of units or sections of units showing the full range of colors, textures, and patterns available for each finish choice indicated.
 - 1. Submit sealant manufacturer's standard bead samples consisting of strips of actual products showing the full range of colors available.
- D. Samples for Verification: 24-inch- (600-mm-) square panels for each finish, color, texture, and pattern specified. Prepare samples using same tools and techniques intended for actual work.
 - 1. Incorporate within each sample a typical control joint filled with sealant of color indicated or selected. Note: Sealant by others.
- E. Installer qualifications: Certification signed by system manufacturer certifying that installers comply with specified requirements. Contractor shall be knowledgeable in the proper installation of the EIFS system and shall provide evidence of a current EIFSSMART certification provided by the Association of Walls and Ceiling (AWCI).
- 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 address of architects and owners, and other information specified.
- G. Material Certificates: Signed by manufacturers or a third-party agency approved by system manufacturer certifying that each of the following items complies with requirements:
 - 1. Insulation.
 - 2. Joint sealants by others.
- H. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include joint sealant manufacturer's written interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- I. Product Test Reports: Indicate compliance of proposed EIFS with physical property requirements specified in "Performance Requirements" Article based on comprehensive testing of current products by a qualified testing and inspecting agency.
- J. Research/Evaluation Reports: Evidence of EIFS compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who is certified in writing by system manufacturer as qualified to install manufacturer's system with a record of successful in service performance of like-type projects.

- B. **Manufacturer Qualifications:** Engage a firm experienced in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance. The manufacturing facility shall be covered by a current ISO 9001:200 Certification. The EIFS manufacturer shall be listed with Factory Mutual, and shall have passed Factory Mutual Corner Test 4880.
- C. **Source Limitations:** Obtain materials for system from one source and by a single manufacturer or by manufacturers approved by EIFS manufacturer as compatible with other system components.
- D. **Fire-Test-Response Characteristics:** Provide system assemblies and components with the following fire-test-response characteristics 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 products with appropriate markings of applicable testing and inspecting agency.
 - 1. **Flame Spread of Insulation Board and Finish Coats:** 25 or less when tested individually per ASTM E 84.
 - 2. **Smoke Developed of Insulation Board and Finish Coats:** 450 or less when tested individually per ASTM E 84.
 - 3. **Install EIFS on mock-up panel** providing range of colors and configurations. Conduct tensile bond testing on mock-up to ensure adequate bond.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original, unopened packages with manufacturer's labels intact and clearly identifying products.
- B. Store materials inside and under cover; keep them dry and protected from the weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.
 - 1. Stack insulation board flat and off the ground.

1.9 PROJECT CONDITIONS

- A. **Environmental Limitations:** Do not install system when ambient outdoor air and substrate temperatures are 40 deg F (4.4 deg C) and falling unless temporary protection and heat are provided to maintain ambient temperatures above 40 deg F (4.4 deg C) during installation of wet materials and until they have dried thoroughly and become weather resistant, but for at least 48 hours after installation.

1.10 COORDINATION AND SCHEDULING

- A. Coordinate installation of EIFS with related Work specified in other Sections to ensure that wall assemblies, including sheathing, flashing, trim, joint sealers, windows, and doors, are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind EIFS.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering Class PB systems that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide Class PB systems by one of the following:
 - 1. Senergy Div, a division of Degussa Company.
 - 2. Dryvit Systems, Inc., a division of RPM International, Inc.
 - 3. Finestone, a division of Degussa Company.
 - 4. Sto Corp.; Sto Finish Systems Div.

2.2 MATERIALS

- A. Compatibility: Provide substrates, adhesive, board insulation, reinforcing meshes, base- and finish-coat materials, sealants, and accessories that are compatible with one another and approved for use by system manufacturer for Project.
- B. Colors, Textures, and Patterns of Finish Coat: Comply with the following requirements:
 - 1. Provide Architect's selections from system manufacturer's full range of colors, textures, and patterns for type of finish coat indicated.
- C. Air/Water-Resistive Barrier: EIFS manufacturer's standard formulation and accessories for use as a weather-resistive barrier at all openings, floorline expansion joints, and exposed head conditions:
 - 1. SENERSHIELD-R®: ready-mixed, flexible Air/Water Resistive Barrier.
 - 2. FLASHING PRIMER: water-based primer for use prior to application of SENERFLASH™ on all acceptable surfaces.
 - 3. 4" SHEATHING FABRIC: 100 mm (4") spunbonded non-woven reinforced polyester web for use with SENERSHIELD-R.
- D. Molded-Polystyrene Board Insulation: Rigid, cellular thermal insulation formed by expansion of polystyrene resin beads or granules in a closed mold. Comply with system manufacturer's requirements, ASTM C 578 for Type I, and "EIMA Guideline Specification for Expanded Polystyrene (EPS) Insulation Board" for more stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:
 - 1. Before cutting and shipping, age insulation in block form by air drying for not less than six weeks or by another method approved by EIMA that produces equivalent results.
 - 2. Provide insulation in boards not more than 24 by 48 inches (610 by 1219 mm) and in thickness indicated but not less than 1-1/2 inches and not more than 4 inches (102 mm) or less than that allowed by ASTM C 1397.
- E. Reinforcing Mesh: Balanced, alkali-resistant, open-weave glass-fiber mesh treated for compatibility with other system materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. (21 dN/cm) per EIMA 105.01, complying with ASTM D 578 and the following requirements for minimum weight:
 - 1. INTERMEDIATE 6: standard/medium weight, 6 oz.

2. INTERMEDIATE 12: intermediate weight, 12 oz.
 3. STRONG 15: heavy weight, 15 oz. used only in combination with Intermediate 6.
 4. CORNER MESH: Intermediate weight, pre-marked for easy bending, for reinforcing at exterior corners.
- F. Adhesives/Base Coats: System manufacturer's standard mixture complying with the following requirements for material composition and method of combining materials:
1. STANDARD Base Coat: 100% acrylic base coat manufactured by BASF Corp, field-mixed with Portland cement complying with ASTM C 150, Type I, white or natural color.
 2. ALPHA DRY Base Coat: Dry-mix base coat containing Portland cement; manufactured by BASF Corp.
 3. XTRA-STOP Base Coat: 100% acrylic-based, water-resistant base coat manufactured by BASF Corp, field-mixed with Portland cement complying with ASTM C 150, Type I, white or natural color.
- G. Primer: EIFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing basecoat surface for application of finish.
- H. Finish-Coat Materials: System manufacturer's standard mixture complying with the following requirements for material composition and method of combining materials:
1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
 2. Texture: As selected by Architect from manufacturer's full range.
 3. Color: As selected by Architect from manufacturer's full range.
 4. SENERFLEX 100% acrylic polymer based finish; air cured, compatible with Base Coat as manufactured by BASF Corp.
- I. Water: Potable.
- J. Flashing: Type as designated on Drawings or as required to suit conditions indicated and to comply with EIFS manufacturer's written instructions.

2.3 ELASTOMERIC SEALANTS

- A. Elastomeric Sealant Products: Provide system manufacturer's listed and recommended chemically curing, elastomeric sealant that is compatible with joint fillers, joint substrates, and other related materials, and complies with requirements for products and testing indicated in "EIMA Guide for Use of Sealants with Exterior Insulation and Finish Systems, Class PB" and with requirements in Division 7 Section 07920 "Joint Sealants" for products corresponding to description indicated below:
1. Low-modulus silicone sealant. I.e. Dow 790, Tremco Spectrem.
- B. Sealant Color: Comply with the following requirements:
1. Provide Architect's selections from manufacturer's full range of standard colors for type of sealant indicated.

2.4 MIXING

- A. General: Comply with system manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by system

manufacturer. Mix materials in clean containers. Use materials within time period specified by system manufacturer or discard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer and Manufacturers representative present, for compliance with requirements for installation tolerances and other conditions affecting performance of system. Proceed with installation of system only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect contiguous work from moisture deterioration and soiling caused by application of systems. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
- B. Protect system, substrates, and wall construction behind them from inclement weather during installation. Prevent infiltration of moisture behind system and deterioration of substrates.
- C. Prepare and clean substrates to comply with system manufacturer's written requirements to obtain optimum bond between substrate and adhesive for insulation.
 - 1. Apply primer-sealer over substrates where required by system manufacturer for improving adhesion or for protecting substrates from degradation.
 - 2. Apply primer-sealer over gypsum sheathing substrates to protect sheathing from degradation.

3.3 INSTALLATION

- A. Comply with ASTM C 1397 and system manufacturer's written instructions for installation of system as applicable to each type of substrate indicated.
- B. Apply EIFS manufacturer's air/water-resistive barrier at all openings, floorline expansion joints, and exposed head conditions.
- C. Adhesively and mechanically attach insulation to comply with ASTM C 1397, system manufacturer's written requirements, and the following:
 - 1. Apply adhesive to insulation by notched-trowel method in a manner that results in adhesive's coating approximately 60% of gypsum sheathing once insulation is adhered to sheathing. Apply adhesive to a height of not less than 1/4 inch (6.4 mm) for factory mixed and not less than 3/8 inch (9.6 mm) for field mixed, measured from the surface of the insulation board before placement. Notched trowel spacing shall be 1-1/2". Adhesive attachment of insulation board over masonry substrates shall be ribbon-and-dab.
 - 2. Press and slide insulation board into place. Apply pressure over the entire surface of the insulation board to accomplish uniform contact, high initial grab, and an overall level surface.
 - 3. Allow adhered insulation to remain undisturbed for period recommended by system manufacturer, but not less than 24 hours, before installing mechanical fasteners, beginning rasping and sanding insulation, or applying base coat and reinforcing mesh.
 - 4. Mechanically attach insulation to substrate by method complying with system manufacturer's written requirements. Space fasteners according to system manufacturer's written requirements for attachment to Project substrate(s) for performance indicated. Install top

surface of fastener head flush with plane of insulation. Install fasteners into or through substrates with the following minimum penetration:

- a. Steel Framing: 5/16 inch (8 mm).
 - b. Masonry: 1 inch (25 mm).
 5. Stagger vertical joints in successive courses to produce running bond pattern. Locate joints so no piece of insulation is less than 12 inches (300 mm) wide or 6 inches (150 mm) high. Offset joints not less than 6 inches (150 mm) from corners of window and door openings.
 - a. Offset joints of insulation not less than 4 inches (100 mm) from horizontal joints in sheathing.
 - b. Offset joints of insulation not less than 4 inches (100 mm) from aesthetic reveals.
 6. Interlock ends at internal and external corners.
 7. Abut boards tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between insulation boards. If gaps greater than 1/16 inch (1.6 mm) occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
 8. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
 9. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/32 inch (0.8 mm) from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch (1.6 mm).
 10. Cut aesthetic reveals in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that comply with profiles and locations indicated. Do not reduce insulation thickness at features to less than 3/4 inch (19 mm).
 11. Install foam shapes attached to supporting substrate, where indicated.
 12. Interrupt insulation for expansion joints where indicated.
 13. Form joints for sealant application by leaving gaps between adjoining insulation edges and between insulation edges and dissimilar adjoining surfaces. Make gaps wide enough to produce joint widths indicated after encapsulating joint substrates with base coat and reinforcing mesh.
 14. Treat exposed edges of insulation board as follows:
 - a. Wrap edges after installing insulation board and before applying field-applied reinforcing mesh.
 - b. Wrap mesh of width required to extend not less than 2-1/2 inches (63 mm) onto substrate behind insulation board, cover insulation board edge, and extend not less than 2-1/2 inches (63 mm) onto insulation board face.
 - c. Wrap edges of insulation board, except those forming substrates of sealant joints, by encapsulating with base coat, reinforcing mesh, and finish coat.
 - d. Wrap edges of insulation board forming substrates of sealant joints within system or between system and other work by encapsulating with base coat and reinforcing mesh.
 15. Treat edges of insulation board at trim accessories by extending base coat, reinforcing mesh, and finish coat over face leg of accessories.
 16. Coordinate flashing installation with installation of insulation to produce a wall system that does not allow water to penetrate behind protective coating.
- D. Install trim accessories at locations indicated according to system manufacturer's written instructions.

- E. Install expansion joints at locations indicated, where required by system manufacturer, and as follows:
 - 1. Where expansion joints are indicated in substrates behind EIFS.
 - 2. Where EIFS adjoins dissimilar substrates, materials, and construction.
 - 3. At floor lines in multilevel wood-frame construction.
 - 4. Where wall height changes.
 - 5. A minimum of every 75 feet horizontally and vertically.
- F. Apply base coat to exposed surfaces of insulation in a two-pass application in minimum thickness specified in ASTM C 1397 (1/16" min. 3/32" max.).
- G. Embed reinforcing mesh of type indicated below in wet base coat to produce wrinkle-free installation with mesh continuous at corners and overlapped not less than 2-1/2 inches (64 mm) or otherwise treated at joints to comply with ASTM C 1397 and system manufacturer's written requirements. Do not lap reinforcing mesh within 8 inches (204 mm) of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are not visible. Double application of basecoat required.
 - 1. Medium impact reinforcing mesh, unless otherwise indicated.
 - 2. Impact-resistant reinforcing mesh where indicated.
- H. Double-Layer Application: Where indicated, apply second base coat and second layer of reinforcing mesh of weight indicated below, in the same manner as first application. Do not apply until first base coat has cured.
 - 1. Medium Impact Reinforcing Mesh.
 - 2. Intermediate Reinforcing Mesh.
- I. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings extending 4 inches (100 mm) beyond perimeter. Apply additional 9-by-12-inch (230-by-305-mm) strip reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch- (200-mm-) wide strip reinforcing mesh at both inside and outside corners, unless base layer of mesh is lapped not less than 4 inches (100 mm) on each side of corners.
 - 1. At aesthetic reveals, apply strip reinforcing mesh not less than 8 inches (200 mm) wide.
 - 2. Embed strip reinforcing mesh in base coat before applying first layer of reinforcing mesh.
- J. Shapes: Fully embed reinforcing mesh in base coat.
- K. Double Base-Coat Application: Where indicated, apply second base coat in the same manner and thickness as first application, except without reinforcing mesh. Do not apply until first base coat has cured.
- L. Apply finish coat, maintaining a wet edge at all times for uniform appearance, in thickness required by system manufacturer to produce a uniform finish of color and texture matching approved sample.
- M. Apply finish coat over dry base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by system manufacturer to produce a uniform finish of color and texture matching approved sample.

3.4 INSTALLATION OF JOINT SEALANTS BY OTHERS

- A. Prepare joints and apply sealants, of type and at locations indicated, to comply with applicable requirements in Division 7 Section 07920 "Joint Sealants" and in "EIMA Guide for Use of Sealants with Exterior Insulation and Finish Systems, Class PB." Except that no EIFS primers or color match finishes shall be applied to the joint where sealant is to be applied.
 - 1. Clean surfaces to receive sealants to comply with indicated requirements and system manufacturer's written instructions.
 - 2. Apply primer recommended in writing by sealant manufacturer for surfaces to be sealed.
 - 3. Install sealant backing to control depth and configuration of sealant joint and to prevent sealant from adhering to back of joint.
 - 4. Apply masking tape to protect areas adjacent to sealant joints. Remove tape immediately after tooling joints, without disturbing joint seal.
 - 5. Recess sealant sufficiently from surface of system so an additional sealant application, including backing rod, can be installed without protruding beyond system surface.
 - 6. Apply joint sealants after base coat has cured but before applying finish coat.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: System manufacturer shall engage a qualified independent testing and inspecting agency to perform field quality-control tests and inspections and to prepare test reports.
 - 1. Testing and inspecting agency will interpret tests and report whether tested Work complies with or deviates from requirements.
- B. Correct deficiencies in or remove and replace EIFS that inspections and test reports indicate do not comply with requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with requirements.

3.6 WARRANTY

- A. Warranty period shall be a 10-year extended warranty.
- B. Contractor shall submit plans and specifications to manufacturer as required.

3.7 CLEANING AND PROTECTION

- A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive system coatings.
- B. Provide final protection and maintain conditions, in a manner acceptable to installer and system manufacturer that ensure system is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 07241

SECTION 07510 – METAL BUILDING ROOF INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Related Sections:

1. Section 07210 “Building Insulation”.
2. Section 13125 “Metal Building Systems”.

B. Work Included:

1. Interior liner fabric of the specified color, support strapping of the appropriate type and color, fasteners of the appropriate type and color, sealants, thermal break materials and thermal insulation of the appropriate type to insulate the roof and wall areas to the designed R-values of the building.
2. The R-values specified are the intended “installed” insulation values. The installed liner system materials shall be capable of providing fall protection to insulators and roof sheeters during initial construction of pre-engineered systems with cee or zee purlin roof structures without extra charge.

1.3 QUALITY ASSURANCE

- A. Provide freshly made materials in the system manufacturers packages together with project specific drawings and instructions of the installation.
- B. Purlins, girts and insulation must be completely isolated from the inside conditioned air with the Bay Liner FP Fabric System liner system to prevent condensation and heat transfer through the conductive metal surfaces.
- C. Taping or stapling of vapor barrier lap joints is not acceptable. Any field joints shall be sealed with the vapor barrier lap sealant and mechanically fastened. Any field seams shall be made on a structural member or on a suitable rigid substrate provided for that purpose.
- D. All parts of the liner support system and insulation shall have flame spread of 25 or less, based on ASTM E-84 test standards (Class A material). The vapor barrier fabric shall be opaque white or other specified colored woven reinforced polyethylene with extrusion-welded seams. Fabricate liner fabric in one piece to fit not less than the full bay length by the width of the building.
- E. Buildings over 100 feet in width may have field seams on the bottom of a ridge purlin or no less than 50' apart. Perimeter edges of the vapor barrier fabric shall be trimmed and sealed to the adjoining steel or fabric with Bay Liner FP Fabric System vapor barrier lap sealant. All edges of liner fabric shall be mechanically fastened with steel retaining straps.
- F. In the event that the crew is not experienced in the installation procedures, on-site installation training shall be requested by the installing contractor from the system manufacturer to assure proper installation procedures; additional charges may apply for training.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be inspected for damage, proper sizes and quantities upon delivery and then stored in a dry, secure manner. Notify carrier and Bay Insulation Systems of any damaged materials, improper sizes or shortages upon delivery at 800-225-8892.
- B. Installation shall proceed with care to assure proper sealing of the liner fabric. Insulation shall be placed on the ceiling liner, or secured in the wall cavity with Fast-R Hangers in the full, specified thickness, without voids or compression.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Include manufacturer's product brochures including specifications of steel support strapping, fasteners, reinforced polyethylene vapor barrier fabric
- C. A sample of a typical seam:
- D. Specific drawings for the project showing purlin spacings; support strap spacings; liner fabric sizes and locations; fastening points; insulation thicknesses, sizes and locations; detailed installation instructions.
- E. Fall Protection:
 - 1. Detailed installation instructions are provided to assure proper installation and function as an alternative form of fall protection in new metal building structures to comply with the new 2001 OSHA fall protection standards. Perimeter edge protection is still required for top-side workers. U.S. Patents # 4446664, # 4573298, # 5901518 and # 5953875 cover Thermal Design, Inc. insulation systems, method and structures.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable systems shall be the Bay Liner FP Fabric System insulation system manufactured by Thermal Design Inc. with a minimum roof insulation R-value of 30. An insulative thermal break shall be applied between conductive surfaces. The Thermal break shall be a second layer of insulating material. R30 "Simple Saver System" as manufactured by Thermal Design, Inc. is also an acceptable system.
- B. No changes or substitutions will be allowed unless submitted and approved at least 10 days prior to bid date. Substitutions of systems that do not have a continuous vapor barrier on the inside plane of the purlins and girts will not be allowed.

2.2 MATERIALS

- A. System components shall meet the following minimum specifications:
 - 1. Steel Strap:
 - a. 100.000 KSI high tensile strength, high carbon, steel, galvanized, primed and painted the specified color on the exposed side.

- b. Minimum size shall be 0.02 x 1"x continuous length.
 - c. The strap color shall be white. Call for specifications on special orders and colors.
- 2. Fasteners:
 - a. For light gauge steel (up to 12 GA purlins): #12 x 3/4" plated, self-drilling screws with washers painted to match the specified strap color. For heavier gauge steel (up to 3/8" purlins/bar joist): #12 x 1-1/4 " plated, self-drilling screws, painted to match the specified strap color.
- 3. Bay Liner FP Fabric System Liner Fabric:
 - a. Shall be woven reinforced high-density polyethylene tapes, coated on both sides with a continuous white or colored polyethylene film.
 - b. The fabric grade for the ceiling shall be: Super White. The fabric shall have a flame-spread index of 25 or less based on ASTM E-84 test standards (Class A).
 - c. The Liner Fabric shall be manufactured in large custom pieces by double extrusion welding from roll goods. Pieces shall be fabricated to substantially fit the large defined building bay areas with minimum practical sealing to be done on job site. Fabric shall be pleat folded to allow for rapid pullout on the tensioned roof strap support system. Minor wrinkles may remain and do not effect performance.
 - d. Liner fabric perm rating shall be: 0.025 grains/hr - sq. foot (based on ASTM E-96, procedure B, "non-inverted water method.")
- 4. Sealants:
 - a. Shall be G524 Polyethylene Vapor Barrier Lap Sealant and/or Syseal Sticky Tape (double sided bonding tape) 3/4" wide by 1/32" thick extruded vapor barrier sealant by Thermal Design, Inc.
- 5. Insulation:
 - a. Shall be fiberglass filler blanket or batt insulation meeting Federal specifications HH-1-588B, Form B, Type 1 or other insulation form as submitted by the system manufacturer and approved by the architect/owner.
- 6. Insulation Hangers:
 - a. Shall be FAST-R™ hangers for supporting insulation between roof purlins if roof pitch is over 4:12.
- 7. Thermal Break (Block): Thermal break shall be: 1/8" thick by 3" wide white, closed-cell polyethylene foam with pressure-sensitive adhesive and peel-off backing and shall be provided if no other thermal break is provided.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Cut to length and install the steel straps in the pattern and spacings as shown on the approved project shop drawings.
- B. The straps are installed in tension, fastened at each end and span immediately below the bottom plane of the purlins. Position the pre-folded vapor barrier fabric on the strap platform along one

eave purlin. Pull out and clamp the two bottom corners at the eave purlin and also centered on the bay. Pull the other end of the pleat folded fabric across the building width off the top of the folded pile, on the strap platform but below the purlins, pausing only at the ridge to fasten the straps and fabric in position where the plane of the roof changes.

- C. Once the fabric is positioned and clamped, the fasteners are installed from the underside at each strap/purlin intersection. The edges are trimmed to fit around the purlin attachment points and then sealed along the rafters. A similar method can be used starting at the ridge purlin space and pulling the fabric to each eave.
- D. The Bay Liner FP Fabric System liner system must be completely installed in a bay to serve as fall protection.
- E. Insulation is unpacked, fluffed to specified thickness and placed on the fabric liner system. In two-layer systems, the second layer of insulation is placed over and perpendicular to the purlins as the roof sheeting is applied. It is important to fill the insulation cavity or the cavities be ventilated to minimize the probability of condensation.
- F. Ventilated and/or dehumidified roof systems are possible with the Bay Liner FP Fabric Systems. Building pressures should always be balanced with the exterior.

END OF SECTION 07510

SECTION 07620 – SHEET METAL FLASHING AND TRIM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes sheet metal flashing and trim in the following categories:
 - 1. Exposed trim and fascia.
 - 2. Metal flashing.
 - 3. Through wall flashings for masonry.
 - 4. Formed roof drainage sheet metal fabrications.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 3 Section 03300 "Cast-in-Place Concrete" for installing reglets.
 - 2. Division 4 Sections for through-wall flashing and other integral masonry flashings specified as part of masonry work.
 - 3. Division 6 Section 06105 "Miscellaneous Carpentry" for wood nailers, curbs, and blocking.
 - 4. Division 7 Section 07620 "Sheet Metal Flashing and Trim" for installing sheet metal flashing and trim integral with roofing membrane.
 - 5. Division 7 Section 07920 "Joint Sealants" for elastomeric sealants.

1.3 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.
- B. Wind-Uplift Resistance: Provide edge metal and coping flashings (except gutters), that meet uplift requirements for building pressures outlined on the structural drawings. Edge metal and coping flashings must meet ANSI/SPRI ES-1 criteria.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- 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 layouts, profiles, shapes, seams, dimensions, and details for fastening, joining, supporting, and anchoring sheet metal flashing and trim.
- 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. Samples for each type of sheet metal flashing and trim.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced 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.
- B. Provide ANSI/SPRI ES-1 certification label on all edge metal and coping flashings. Minimum one label per 10 foot section.
- C. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof eave, including built-in gutter, fascia, fascia trim, apron flashing, approximately 48 inches (1200 mm) long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Pre-Installation Conference: Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Contractor shall notify Architect of conference date, time, and location and also verify receipt of approved shop drawings by installer prior to conference. Conference shall include the following attendees: Representatives for Owner, Architect, Engineer, GC's project manager and site superintendent, installer's field superintendent, and any other parties involved with preparation and installation of material and all accessories

1.6 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. Anodized Aluminum Sheet: ASTM B 209 (ASTM B 209M), 5005-H14, with a minimum thickness of 0.050 inch.
 - 2. Factory-Painted Aluminum Sheet: ASTM B 209 (ASTM B 209M), 3003-H14, with a minimum thickness of 0.040 inch, unless otherwise indicated.
- B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792, Class AZ-50 coating, Grade 40 (ASTM A 792M, Class AZ-150 coating, Grade 275) or to suit project conditions, with 55 percent aluminum, not less than 0.0396 inch thick, unless otherwise indicated.

2.2 CONCEALED THROUGH-WALL SHEET METAL FLASHING

- A. Material: Fabricate from the following metal: Copper: 3 oz. (conforming to ASTM B 370), Copper/Kraft paper flashing with asphalt compound for full concealed flashing.

- B. Installation of through-wall metal flashings embedded in masonry as follows: Flashing shall be laid in a trowel coating or spotting of Sandel Asphalt Trowel Mastic, Copper face down, on top of poured concrete or masonry block. Flashing will be extended a minimum of 2" on both sides. Seal with Sandel Asphalt Trowel Mastic or as recommended by flashing manufacturer, to make watertight where flashing is pierced by anchor bolts.
- C. Installation of through-wall metal flashings for Masonry Veneer as follows: Install flashings in a slurry of fresh mortar and topped with a fresh bed of mortar starting flush with the outside face of masonry. Run flashing down a minimum of 8" (three brick or one CMU course(s)). Break flashing horizontal and run to outside (brick/CMU) wythe face with ¼" min., turn-down drip edge. Flashing edge must be visible continuously (verify with Architect) after joint has been tooled. Lap flashings a minimum of 4" at ends and beginning of each run. Lap to receive full buttering of mastic from edge to edge each direction. (Lap to lap and end to end.) extend all head flashings a minimum of 6" beyond opening each side and turn ends up 2" to form a pan. Provide pre-formed 12 oz. Copper inside and outside corners. Provide 4" typical overlap from each direction of continuous flashing at corner units. For stud wall construction flashing shall be installed through the veneer and turned up on face of rigid insulation 6" minimum. Provide continuous seal (termination bar, screws and butyl tape) at top of flashing attached to rigid insulation and set in continuous, full bed of mastic as approved by manufacturer.
- D. Through wall flashing shall be provided at base of all walls, over all exterior door and window openings, below all exterior window sill openings and at all roof to wall intersections.
- E. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Sandel Manufacturing Co., Inc.
 - 2. Approved Equivalent.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Burning Rod for Lead: Same composition as lead sheet.
- B. Solder: ASTM B 32, Grade Sn50, used with rosin flux.
- C. 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.
- D. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.
- E. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- F. 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 Division 7 Section 07920 "Joint Sealants."
- G. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.
- H. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.
- I. Polyethylene Underlayment: ASTM D 4397, minimum 10-mil thick black polyethylene film, resistant to decay when tested according to ASTM E 154.

- J. 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. All exposed metal accessories shall be pre-finished aluminum.
- K. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

2.4 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 nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- G. 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.
- 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.

2.5 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. Contractor to provide edge metal and coping flashings from manufacturer of prefabricated metals or NRCA's ANSI/SPRI ES-1 certified sheet metal shops.
- B. Gutters with Girth up to 15 Inches: Fabricate from the following material:
 - 1. Aluminum: 0.0320 inch thick.

C. Downspouts: Fabricate from the following material:

1. Aluminum: 0.032 inch thick.

D. Scuppers: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

E. Exposed Trim, Gravel Stops, and Fasciae: Fabricate from the following material:

1. Aluminum: 0.040 inch thick.

F. Copings: Fabricate from the following material:

1. Aluminum:
 - a. Girth up to 12 inches 0.040 inch thick with .040 inch thick cleat.
 - b. Girth up to 18 inches 0.040 inch thick with .050 inch thick cleat.
 - c. Girth up to 24 inches 0.050 inch thick with .063 inch thick cleat.

G. Equipment Support Flashing: Fabricate from the following material:

1. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch thick.

2.6 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.

2.7 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 expand 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 resin by weight; complying with AAMA 605.2.
2. Color and Gloss: As selected by Architect/Owner from manufacturer's full range of colors and color densities.

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. Sealed Joints: Form nonexpansion, 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.
- 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. 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 coat of roofing cement where required for waterproof performance.
- F. 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 and bed with sealant.
- G. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.
- H. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing as follows:
 - 1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
 - 2. Seal and clamp flashing to pipes penetrating roof, other than lead flashing on vent piping.
- I. Coping Caps: All joints along straight runs of prefinished coping cap shall be joined utilizing typical 1" vertical seams. Additionally, all coping cap sections shall be attached on the interior and exterior face with concealed continuous securement cleats. Prior to the installation of any coping cap, a 20-mil PVC continuous underlayment which covers the entire horizontal section and extends down both vertical faces shall be installed.

- J. Typical Lap Joints (associated with drip edge, apron flashings, miscellaneous trim, etc.): All joints shall be lapped a minimum of four inches and sealed. Additionally, each lap shall be notched and hemmed to ensure proper seating of the two surfaces.

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 Substantial Completion.

END OF SECTION 07620

SECTION 07920 – JOINT SEALANTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes sealants for the following applications, including those specified by reference to this Section:

1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
 - a. Control and expansion joints in unit masonry.
 - b. Perimeter joints between materials listed above and frames of doors and windows.
 - c. Other joints as indicated by the drawings.
2. Exterior joints in the following horizontal traffic surfaces:
 - a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
 - b. Tile control and expansion joints.
 - c. Joints between different materials listed above.
 - d. Other joints as indicated.
3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - e. Other joints as indicated.
4. Interior joints in the following horizontal traffic surfaces:
 - a. Control and expansion joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - c. Other joints as indicated.

- B. Related Sections include the following:

1. Division 4 for masonry control and expansion joint fillers and gaskets.
2. Division 8 08800 "Glazing" for glazing sealants.
3. Division 9 09511 "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- D. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- E. Product Test Reports: From a qualified testing agency indicating sealants comply with requirements, based on comprehensive testing of current product formulations.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use manufacturers standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
- D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
 - 3. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

- B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
 - 2. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 WARRANTY

- 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.
- B. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- C. Special Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.
- C. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.

3. Sealant Primers for Porous Substrates: 775 g/L.

D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant, including those referencing ASTM C 920 classifications for type, grade, class, and uses.
- B. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- C. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- D. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

2.3 LATEX JOINT SEALANTS

- A. Latex Sealant Standard: Comply with ASTM C 834, Type O P, Grade NF for each product of this description.

2.4 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Type C: Closed-cell material with a surface skin.
 - 2. Type O: Open-cell material.
 - 3. Type B: Bicellular material with a surface skin.
 - 4. Type: Any material indicated above, utilize where required for proper application
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. 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.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 – EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply

with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

- B. 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.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.
- E. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealants from surfaces adjacent to joint.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.
 - 5. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.
- G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
 - 1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.

2. Apply a bead of silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's printed schedule and covering a bonded area of not less than a 3/8 inch. Hold edge of sealant bead inside of masking tape by 1/4 inch.
 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
 4. Complete installation of horizontal joints before installing vertical joints. Lap vertical joints over horizontal joints. At end of joints, cut silicone extrusion with a razor knife.
- H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, to 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 to comply with sealant manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates as follows:

1. Test Method: Test joint sealants by hand-pull method described below:
 - a. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross cut at one end. Place a mark 1 inch from cross-cut end of 2-inch piece.
 - b. Use fingers to grasp 2-inch piece of sealant between cross-cut end and 1-inch mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
 - c. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.
2. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
3. Inspect tested joints and report on the following:
 - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field- adhesion hand-pull test criteria.
 - b. Whether sealants filled joint cavities and are free from voids.
 - c. Whether sealant dimensions and configurations comply with specified requirements.
4. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.

B. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants

that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants 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 joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 07920

SECTION 08114 – CUSTOM STEEL DOORS AND FRAMES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes custom-fabricated, commercial-quality steel doors and frames for doors and related openings, including hollow-metal panels and louvers in these doors and frames. This section also includes stainless steel door frames and aluminum door frames.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 4 Sections for building anchors into and grouting frames in masonry construction.
 - 2. Division 8 Section 08211 "Flush Wood Doors" for hollow-core and solid-core wood doors installed in steel frames.
 - 3. Division 8 Section 08710 "Finish Hardware" for door hardware and weatherstripping.
 - 4. Division 8 Section 08800 "Glazing" for glass in steel doors and sidelights.
 - 5. Division 9 Section 09255 "Gypsum Board Assemblies" for spot grouting frames in gypsum board partitions.
 - 6. Division 9 Section 09900 "Painting" for field painting primed doors and frames.

1.3 DEFINITIONS

- A. Metal Thickness: Sheet metal thicknesses given in inch-pound dimensions are nominal thicknesses and subject to tolerances as defined in the ASTM standards listed for the following materials:
 - 1. Steel Sheet: ASTM A 568 (ASTM A 568M).
 - 2. Galvanized Steel Sheet: ASTM A 525 (ASTM A 525M).(For exterior doors and frames).

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data including manufacturer's specifications for fabrication and installation. Provide data substantiating that products comply with requirements.
- C. Shop Drawings showing fabrication and installation of custom steel doors and frames work. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of frame anchorage, door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
 - 1. Provide a schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
- D. Samples representing the required construction of doors and frames for Project.

1. Doors showing vertical-edge, top, and bottom construction; insulation, face stiffeners, hinge, and other applied hardware reinforcement. Include louver section and glazing stops where applicable.
 2. Frames showing profile, welded corner joint, welded hinge reinforcement, dust-cover boxes, floor and wall anchors, stops, and silencers. Include panel and louver sections and glazing stops where applicable.
- E. Oversize Construction Certification: For door assemblies required to be fire rated and exceeding limitations of labeled assemblies, submit certification of a testing agency acceptable to authorities having jurisdiction that each door and frame assembly has been constructed to conform to design, materials, and construction equivalent to requirements for labeled construction.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Engage a firm experienced in manufacturing custom steel doors and frames similar to those indicated for this Project and that have a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work.
- 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 authorities having jurisdiction.
1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors conform to all standard construction requirements of tested and labeled fire-rated door assemblies except for size.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 needed by General Contractor.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletted, wrapped, or crated to provide protection during transit and job storage.
- 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-high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to promote air circulation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering steel doors and frames that may be incorporated in the Work include, but are not limited to, the following:

- B. Manufacturers: Subject to compliance with requirements, provide steel doors and frames by one of the following:

1. Allied Steel Products, Inc.
2. American Steel Products Corp.
3. Ceco Corp. an Assa Abloy Group company.
4. Kewanee Corp.
5. Precision Metals, Inc.
6. Steelcraft, a Division of Ingersoll-Rand.
7. Curries, Inc. an Assa Abloy Group company.
8. Palmetto Metal Products.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheets: Commercial-quality, level, carbon steel, complying with ASTM A 366 (ASTM A 366M).
- B. Galvanized Steel Sheets: Zinc-coated carbon-steel sheets of commercial quality, complying with ASTM A 526 (ASTM A 526M) and ASTM A 525 with A 60 or G 60 (ASTM A 525M with Z 180 or ZF 180) coating designation, mill phosphatized.
- C. Supports and Anchors: Fabricated from not less than 0.06-inch-thick steel sheet. After fabricating, galvanize units to be built into exterior walls, complying with ASTM A 153, Class B.
- D. 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.

2.3 DOORS

- A. General: Provide flush-design doors, 1-3/4 inches thick, seamless hollow construction, unless otherwise indicated.
1. For single-acting swing doors, bevel both vertical edges 1/8 inch in 2 inches. For double-acting swing doors, round vertical edges with 2-1/8-inch radius.
 2. Unless otherwise required for acoustical or thermal doors, provide filler of fiberboard, mineral-wool board, or other insulating material solidly packed to full door height to fill voids between inner-core-reinforcing members.
 3. Reinforce doors with rigid tubular frame where stiles and rails are less than 8 inches wide. Form tubular frame with 0.0598-inch-thick steel, welded to outer sheets.
- B. Galvanized Steel Doors: For the following locations, fabricate doors from 2 outer, galvanized, stretcher-leveled steel sheets not less than 0.0635 inch thick. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces or stile edges, except around glazed or louvered panel inserts. Provide weep-hole openings in bottom of doors to permit escape of entrapped moisture. Close bottom edge with minimum 0.0635-inch-thick galvanized steel closing channel and top edge with minimum 0.0635-inch-thick galvanized steel filler channel so webs of channels are flush with bottom and top edges. Seal joints in top edges of doors against water penetration.
1. At exterior locations.
 2. Reinforce inside of doors with vertical steel sheet sections not less than 0.0299 inch thick. Space vertical reinforcing 6 inches o.c. and extend full door height. Spot weld to both face sheets at not more than 6 inches o.c.

- a. Continuous truss-form inner core of 0.0149-inch-thick steel sheet reinforcing may be provided as inner reinforcement in lieu of above. Spot weld truss-form reinforcement 3 inches o.c. vertically and horizontally over entire surface on both sides.
 - 3. Reinforce tops and bottoms of doors with 0.0598-inch-thick horizontal steel channels spot welded maximum 6 inches o.c. to outer sheets. Close top and bottom edges to provide flush, waterproof weather seal, as integral part of door construction or by adding inverted steel channels at least 0.0598 inch thick.
- C. Steel Doors: Unless otherwise indicated, fabricate interior doors of 2 outer, cold-rolled, stretcher-leveled steel sheets not less than 16 guage. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces or stile edges, except around glazed or louvered panel inserts, pre-machined and pre-fitted to jamb.
 - 1. Reinforce inside of doors with vertical, hot-rolled, not less than 0.0299-inch-thick steel sheet sections. Space vertical reinforcing 6 inches o.c. and extend full door height. Spot weld to both face sheets at not more than 6 inches o.c.
 - a. Continuous truss-form inner core of 0.0149-inch-thick sheet metal reinforcing may be provided as inner reinforcement in lieu of above. Spot weld truss-form reinforcement 3 inches o.c. vertically and horizontally over entire surface on both sides.
 - 2. Reinforce tops and bottoms of doors with 0.0478-inch-thick horizontal steel channels spot welded maximum 6 inches o.c. to outer sheets.
- D. Fire Door Cores: As required to provide fire protection and temperature rise indicated.
- E. Astragals: As required by NFPA 80 to provide fire ratings indicated.
- F. Hardware Reinforcement: Minimum thickness of steel reinforcing plates for the following hardware:
 - 1. Hinges and Pivots: 0.1793 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 - 2. Lock Face, Flush Bolts, Closers, and Concealed Holders: 0.1046 inch.
 - 3. All Other Surface-Mounted Hardware: 0.0598 inch.

2.4 PANELS

- A. Provide panels of same materials, construction, and finish as specified for doors.

2.5 STEEL FRAMES

- A. Fabricate frames of full-welded unit construction, with corners mitered, reinforced, and continuously welded full depth and width of frame. Knock-down frames are not acceptable.
 - 1. For exterior use, form frames from galvanized steel sheets not less than 16 guage fully welded.
 - 2. For interior use, form frames from either cold- or hot-rolled steel sheet of the following minimum thicknesses:
 - a. Openings up to and Including 48 Inches Wide: 0.0598 inch.
 - b. Openings over 48 Inches wide: 16 guage fully welded.
- B. Hardware Reinforcement: Minimum thickness of steel reinforcing plates for the following hardware:

1. Hinges and Pivots: 0.1793 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 2. Strikes, Flush Bolts, and Closers: 0.1046 inch.
 3. Surface-Mounted Hold-Open Arms and Panic Devices: 0.1046 inch.
- C. Mullions and Transom Bars: Provide closed or tubular mullions and transom bars where indicated. Fasten mullions and transom bars at crossings and to jambs by butt welding. Reinforce joints between frame members with concealed clip angles or sleeves of same metal and thickness as frame.
1. Provide false head member to receive lower ceiling where frames extend to finish ceilings of different heights.
- D. Head Reinforcing: Where installed in masonry, leave vertical mullions in frames open at top for grouting.
- E. Jamb Anchors: Furnish jamb anchors as required to secure frames to adjacent construction, formed of not less than 0.0516-inch-thick galvanized steel.
1. Masonry Construction: Adjustable, flat, corrugated, or perforated, T-shaped to suit frame size, with leg not less than 2 inches wide by 10 inches long. Furnish at least 3 anchors per jamb up to 90 inches in height, 4 anchors up to 96 inches in jamb height, and 1 additional anchor for each 24 inches or fraction thereof over 96 inches in height.
 2. Metal-Stud Partitions: Insert type with notched clip to engage metal stud, welded to back of frames. Provide at least 4 anchors for each jamb for frames up to 90 in height, 5 anchors up to 96 inches in jamb height, and 1 additional anchor for each 24 or fraction thereof over 96 inches in height.
- F. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, formed of not less than 0.0747-inch-thick galvanized steel sheet, as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with 2 holes to receive fasteners, welded to bottom of jambs and mullions.
 2. Separate Topping Concrete Slabs: Adjustable type with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.
- G. Head Anchors: For frames more than 42 inches wide mounted in steel-stud walls, provide 2 head anchors.
- H. Head Strut Supports: Provide 3/8-by-2-inch vertical steel struts extending from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
- I. Structural Reinforcing Members: Provide as part of frame assembly, where indicated at mullions, transoms, or other locations that are to be built into frame.
- J. Head Reinforcing: For frames over 48 inches wide in masonry wall openings, provide continuous steel channel or angle stiffener, not less than 0.1046 inch thick for full width of opening, welded to back of frame at head.
- K. Spreader Bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions.

- L. Rubber Door Silencers: Except on weatherstripped doors, drill stop in strike jamb to receive 3 silencers on single-door frames and drill head jamb stop to receive 4 silencers on double-door frames. Install plastic plugs to keep holes clear during construction.
- M. Plaster Guards: Provide 0.0179-inch-thick steel plaster guards or dust-cover boxes, welded to frame, at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.
- N. Frame Turn Backs: Provide extended "turned back flanges" for frames as indicated on the drawings.
- O. Removable Mullions: Provide removable mullions (one side blind) for pairs on doors as indicated. Mullions to meet NFPD 80 and fasten securely at both door head and floor with manufacturer's standard system for removable mullions.

2.6 LOUVERS

- A. Door Louvers: Fabricate louvers and mount flush into doors without overlapping moldings on surface of door facing sheets.
- B. Provide internal support as recommended by louver manufacturer. Prime paint after fabrication, except stainless steel.
 - 1. Interior Louvers: Sight-proof, stationary type, constructed of inverted Y-shaped blades formed of 0.0359-inch-thick cold-rolled steel, except 0.0375-inch-thick stainless steel for stainless-steel doors.
- C. Louvered Panels: Provide for installation in frames where indicated.
 - 1. Exterior Louvers: Not less than 0.0635-inch-thick galvanized steel sheet. Fabricate units with stationary, weatherproof Z-shaped blades and U-shaped frames, not less than 1-3/8 inches thick. Space louver blades not more than 1-1/2 inches o.c. Assemble units by welding. Provide removable insect screens on interior side of frame, consisting of 18-by-14 mesh formed with 0.011-inch-diameter galvanized steel wire in rigid, formed metal frame.
 - 2. Interior Louvers: Not less than 0.0478-inch-thick cold-rolled steel sheet. Fabricate units with stationary, sight-proof inverted V-shaped blades and U-shaped frames, not less than 1-3/8 inches thick. Space louver blades not more than 3 inches o.c. Assemble units by welding.

2.7 STOPS AND MOLDINGS

- A. Provide stops and moldings around solid, glazed, and louvered panels where indicated.
- B. Form fixed stops and moldings integral with frame, unless otherwise indicated.
- C. Provide removable stops and moldings where indicated or required, formed of not less than 0.0359-inch thick steel sheets matching steel of frames. Secure with countersunk flat or oval head machine screws spaced uniformly not more than 12 inches o.c. Form corners with butted hairline joints.
- D. Coordinate rabbet width between fixed and removable stops with type of glass or panel and type of installation indicated.

2.8 FABRICATION

- A. Fabricate doors and frames rigid, neat in appearance, and free from defects, warp, or buckle. Accurately form metal to required sizes and profiles. Where practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at the Project site. Weld exposed joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - 1. Interior Doors: Minimum 0.0478-inch-thick face sheets.
 - 2. Exterior Doors: Minimum 0.0635-inch-thick face sheets.
- B. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- C. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors and frames fabricated as thermal-insulating assemblies and tested according to ASTM C 236 or ASTM C 976.
 - 1. Unless otherwise indicated, provide thermal-rated assemblies with U-value rating of 0.68 to 0.19 Btu/sq. ft. x h x deg F.
- D. Sound-Rated (Acoustical) Assemblies: Where shown or scheduled, provide door and frame assemblies fabricated as sound-reducing type, tested according to ASTM E 1408, and classified according to ASTM E 413.
 - 1. Unless otherwise indicated, provide acoustical assemblies with STC sound ratings of 33 or better.
- E. Hardware Preparation: Prepare doors and frames to receive hardware, including cutouts, reinforcing, mortising, drilling, and tapping according to final hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 Series specifications for door and frame preparation for hardware.
 - 1. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
 - 2. Locate hardware as indicated or, if not indicated, according to the Hollow Metal Manufacturers Association's HMMA 830, "Hardware Preparation and Locations for Hollow Metal Doors and Frames".

2.9 FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Shop Painting: Clean, treat, and paint exposed surfaces of steel doors and frames, including galvanized surfaces, but excluding stainless-steel surfaces.
 - 1. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before applying paint.
 - 2. Apply pretreatment to cleaned metal surfaces; use cold phosphate solution (SSPC-PT 2), hot phosphate solution (SSPC-PT 4), or basic zinc chromate-vinyl butyral wash primer (SSPC-Paint 27).

3. Apply shop coat of prime paint within time limits recommended by pretreatment manufacturer. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.
- C. Galvanized Steel Doors and Frames: Apply primers and finishes to doors and frames after fabrication.
1. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply baked-on or air-dried primer immediately after cleaning and pretreatment.
- D. Steel Doors and Frames: Apply primers and finishes to doors and frames after fabrication.
1. 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).
 2. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited for top coating to be applied.
 3. 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. Frames: Install custom steel frames for doors, transoms, sidelights, borrowed lights, and other openings, of size and profile as indicated.
1. Install frames and accessories according to manufacturer's installation instructions and as specified.
 2. Setting Masonry Anchorage Devices: Provide masonry anchorage devices where required for securing frames to in-place concrete or masonry construction.
 - a. Set anchorage devices opposite each anchor location, according to details on Shop Drawings and anchorage device manufacturer's instructions. Leave drilled holes rough, not reamed, and free from dust and debris.
 3. Floor anchors may be set with powder-actuated fasteners instead of masonry anchorage devices and machine screws, if so indicated on Shop Drawings.
 4. Placing Frames: Set frames accurately in position, plumb, align, and brace securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, place frames according to NFPA 80.
 - b. Field splice only at approved locations. Weld, grind, and finish as required to conceal evidence of splicing on exposed faces.
 - c. Remove spreader bars only after frames or bucks have been properly set and secured.
- B. Doors: Fit non-fire-rated doors accurately in their respective frames, with the following clearances:
1. Jambs and Head: 3/32 inch.

2. Meeting Edges, Pairs of Doors: 1/8 inch.
3. Bottom: 3/8 inch, where no threshold or carpet.
4. Bottom: 1/8 inch, at threshold or carpet.

C. Place fire-rated doors with clearances as specified in NFPA 80.

D. Comply with NFPA 105 for installing smoke-control doors.

3.2 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames that are warped, bowed, or otherwise unacceptable.
- B. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- C. Damage or rusted areas on frame finish during construction shall be sanded.
- D. Bent or crimped frames and doors as a result of damages due to construction work shall be replaced, primed and finished at Contractor's expense.

END OF SECTION 08114

SECTION 08211 – FLUSH WOOD DOORS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Solid-Core Doors with Wood-Veneer Faces.
- 2. Factory Fitting Flush Wood Doors to Frames and Factory Machining for Hardware.
- 3. Louvers for Flush Wood Doors.
- 4. See Drawings for Applicable Items.
- 5. Factory Finishing of Doors.

- B. Related Sections include the following:

- 1. Division 8 Section 08800 "Glazing" for glass view panels in flush wood doors.
- 2. Division 8 Section 08114 "Custom Steel Doors and Frames"
- 3. Division 8 Section 08710 "Finish Hardware"

- C. References: (USE MOST CURRENT, ADOPTED EDITION)

- 1. American National Standards Institute (ANSI)
 - a. A115-W – 1995, WOOD DOOR HARDWARE STANDARDS Hardware Preparations.
 - b. A117.1 – 2017, Accessible and Usable Buildings and Facilities.
- 2. American Society for Testing and Materials (ASTM)
 - a. ASTM E 119-00a, Standard Test Methods for Fire Tests of Building Construction and Materials.
- 3. Door and Hardware Institute (DHI)
 - a. Locations for Architectural Hardware for Standard Steel Doors and Frames.
 - b. Sequence and Format for the Hardware Schedule.
 - c. Hardware for Labeled Fire Doors.
 - d. Hardware for Health Care Facilities.
 - e. Abbreviations and Symbols.
- 4. HPVA – Hardwood and Plywood Veneer Association.
- 5. International Building Code (IBC).
- 6. National Electrical Manufacturers Association (NEMA).
- 7. National Fire Protection Association (NFPA).
- 8. NFPA-80 Standard for Fire Doors and Windows.
 - a. NFPA-80A Recommended Practice for Protection of Buildings from Exterior Fire Exposures.

- b. NFPA-101 Life Safety Code.
 - c. NFPA-101A Guide on Alternative Approaches to Life Safety.
 - d. NFPA-101B Code for Means of Egress for Buildings and Structures.
 - e. NFPA-105 Recommended Practice for the Installation of Smoke-Control Door Assemblies.
 - f. NFPA-252 Standard Methods of Fire Tests of Door Assemblies.
- 9. Steel Door Institute (SDI)
 - a. SDI-105-98 Recommended Erection Instructions for Steel Frames.
 - b. SDI-117-93 Manufacturing Tolerances for Standard Steel Doors and Frames.
 - c. SDI-122-99 Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
 - d. SDI-124-98 Maintenance of Standard Steel Doors and Frames.
- 10. Underwriters Laboratories (UL)
 - a. UL 10C/UBC7-2-97 Fire Tests of Door Assemblies Positive Pressure
 - b. UL 1784-90 Air Leakage Tests of Door Assemblies
 - c. Door Assemblies Air Leakage Test (1784-90)
- 11. International Building Code (IBC), latest edition:
 - a. NFPA 252 - 17, Fire Test of Door Assemblies.
- 12. AWI Quality Standard: (AWI)
 - a. Architectural Woodwork Quality Standards for grade of door, core, construction, finish, and other requirements.

1.3 SUBMITTALS

A. General Requirements:

- 1. Scope of work is to provide flush wood doors in compliance with the approved shop drawings, approved finish hardware schedule and approved door and frame schedule.
- 2. Wood doors to meet positive pressure Category A or B requirements (as required by specification).

B. Product Data: For each type of door. Include details of core and edge construction, trim for openings, and louvers.

C. 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.
- 4. Indicate Fire Ratings for Fire Doors.

D. Samples for Verification: As follows:

- 1. Submit samples of wood veneer and factory finishing in accordance with AWI Quality Standards.
- 2. Submit 12" x 12" corner sample of each different type of door, .i.e. PC, SCL, FD1.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies in accordance NFPA 252 and which are labeled and listed for ratings indicated by ITS – Warnock Hersey, UL or other testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Doors: Comply with UBC 7-2 1997 where required.
 - 2. Provide intumescent requirements in compliance with UL-10C Category A.
 - 3. Provide doors that comply with UL10C Category B and coordinate with Section 08710 “Finish Hardware” for applied Category G sealing systems Category B.
- C. AWI_for grade of door, core, construction, finish, and other requirements.
- D. Certification of Label Construction:
 - 1. Warnock Hersey, Inc (WH).
 - 2. Underwriters Laboratories, Inc. (UL).
- E. Pre-Installation Conference: Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Contractor shall notify Architect of conference date, time, and location and also verify receipt of approved shop drawings by installer prior to conference. Conference shall include the following attendees: GC's Project Manager and Site Superintendent, Installer's Field Superintendent, manufacturer's representative, and any other parties involved with preparation and installation of material and all accessories.

1.5 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.
 - 2. Storage area for wood doors is to be in a dried, conditioned and secure area with controlled and stabilized humidity conditions per manufacturers recommendations.
- B. Marking and Packaging:
 - 1. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags or concealed markings.
 - 2. Prefinished Doors to have 5 mil peel applied to both sides.
- C. Delivery: Coordinate delivery with Installer not less than 3 weeks prior to delivery.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with requirements of the referenced quality standard for Project's geographical location.

1.7 WARRANTY

- A. General Warranty: Door manufacturer's 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. 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 inch in a 42-by-84- section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch 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. Algoma Hardwoods, Inc.
 - b. Eggers Industries; Architectural Door Division.
 - c. Lambton.
 - d. Or Approved Equivalent per Section 01632.
 - 2. Metal Louvers for Doors:
 - a. Air Louvers, Inc.
 - b. Anemostat Door Products.
 - c. Construction Specialties, Inc.
 - d. Leslie-Locke, Inc.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Factory Finished Doors with Transparent Finish: Comply with AWI Division 1500-S-4 Finish System Standards and with the following requirements:
 - 1. Grade: Custom (Grade A faces).
 - 2. Faces: Plain Sliced, Birch Veneer With Factory UV Finish
 - 3. Face Assembly: Book Match

2.3 MATERIALS

- A. Door Construction:

1. Non-Fire_Rated Doors: Thickness: 1-3/4 inches , interior flush wood, bonded, solid core conforming to AWI Custom Grade requirements and the following;
 - a. Core: Solid Wood Core (WC) wood stave lumber conforming to AWI Custom Grade requirements.
 - b. Door construction shall conform to AWI Custom Grade requirements.
 - c. Stiles: Hardwood to match face veneer over 5-ply solid core with bonded and sanded core glued using type one adhesive.
 - d. Rails: Mill option hardwood or SCL. Top and bottom: minimum of 1 1/8" inches.
 - e. Facing: Wood veneer as specified.
2. Fire Rated Doors: Thickness: 1-3/4 inches, interior flush wood, bonded, solid core conforming to AWI Custom Grade requirements and the following;
 - a. Core: bonded mineral core (FD) conforming to to AWI Custom Grade requirements.
 - b. Door construction shall conform to AWI Custom Grade requirements.
 - c. Stiles: Hardwood to match face veneer over mineral composite, glued to core.
 - d. Rails: Mineral composite as required by fire door authorities. Top and bottom: as required by manufacturer's fire door authorities.
 - e. Facing: Wood veneer as specified.
 - f. Furnish category "A" imbedded intumescent seal where required for positive pressure (UL10-C).
3. Fire Rated Doors: Thickness: 1-3/4 inches, interior flush wood, bonded, solid core conforming to AWI Custom Grade requirements and the following;
 - a. Core: bonded mineral core (FD) conforming to AWI Custom Grade requirements.
 - b. Door construction shall conform to AWI Custom Grade requirements.
 - c. Stiles: Hardwood to match face veneer over mineral composite, glued to core.
 - d. Rails: Mineral composite as required by fire door authorities. Top and bottom: as required by manufacturer's fire door authorities.
 - e. Facing: Wood veneer as specified.
 - f. Furnish category "A" imbedded intumescent seal where required for positive pressure (UL10-C).

B. Adhesives

1. Adhesives: Face to core adhesives shall be Type I as appropriate for location in building. Adhesives must be classified Type I.

2.4 LOUVERS AND LIGHT FRAMES

- A. Wood Louvers: Door manufacturer's standard solid wood louvers, unless otherwise indicated.
- B. Wood Frames for Light Openings: As follows:
 1. Wood Species: Same species as door faces.
 2. Profile: Manufacturer's standard shape.
 3. Frames for Openings in Fire Doors: Wood frames and metal glazing clips approved for use in fire-rated wood-core doors.
 4. Wood-Veneered Beads for Light Openings in Fire Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.

C. Metal Louvers:

1. General: Provide Minimum 20 gauge louver frame with minimum 20 gauge louver blades. Louver blades to be sight proof inverted Y type.
2. Non-Rated doors: Provide Advantage 8CY Series louver.
3. Fire-Rated Doors: Provide Advantage 200AIL, Intumescent Louver fire rated for 90 minutes UL10C.
4. Fasteners: Provide manufacturers standard mechanical fasteners. Exposed fasteners to be on secure side of door.

D. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.0478-inch-thick, cold-rolled steel sheet and factory primed.

1. Non-Rated Doors: Flush Wood Frames, hardwood to match facing. Flush Bead W-9.
2. Fire Rated Doors: Provide metal vision frame with ITS – Warnock Hersey or UL approved glazing system.
3. Fasteners: Provide manufacturers standard mechanical fasteners. Exposed fasteners to be on secure side of door.
4. Glass: Refer to Section 08800 “Glazing” for glass types and thickness. Glazing furnished by others.

2.5 FACTORY FINISHING

A. Doors for Transparent Finish: Shop seal faces and edge of doors, including cutouts, with stain (if required), other required pretreatments, and first coat of finish as specified in this Section.

B. General: Comply with AWI's “Architectural Woodwork Quality Standards Illustrated” for factory finishing.

C. Finish Doors at Factory.

D. Transparent Finish:

1. Grade: Custom.
2. Finish: Manufacturer's standard finish with performance comparable to AWI System TR-6 catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Effect: Semifilled finish.
5. Sheen: Semi-Gloss.

2.6 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of AWI Custom Grade requirements for fitting.
2. Comply with requirements of NFPA 80 for fire-rated doors.

B. Fabricate wood doors in accordance with requirements of AWI Quality Standards.

C. Fabricate fire rated doors in accordance with requirements of ITS – Warnock Hersey or Underwriters' Laboratories, with metal label on each door including UL-10C.

- D. Provide blocking for hardware per hardware manufacturers requirements for hardware to be installed without thru-bolts.
- E. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated and as follows:
 - 1. 5-Inch Top-Rail Blocking.
 - 2. 5-Inch Bottom-Rail Blocking.
 - 3. 6-by-10-Inch Lock Blocks.
 - 4. 5-Inch Midrail Blocking.
- F. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- G. Bevel lock and hinge edges of single acting doors 3 degrees or 1/8 inch in 2 inches. Radius strike edge of double acting swing doors as required by pivot hinge manufacturer.
- H. Prepare doors to receive hardware. Refer to Section 08710 - Hardware and NFPA 80 for hardware requirements including UL-10C.
 - 1. Prefit and bevel to net opening size less approximately 1/4 inch in width on single swing doors 3/16" inch in width for paired doors. Provide 1/4 inch clearance above finished floor, unless otherwise indicated on drawings. Provide 1/8 inch clearance at top of door.
 - 2. Slightly ease vertical edges.
- I. Fire Rated Pair of Doors; greater than 20 minute: Supply overlapping astragals or metal edge sets only as required by NFPA 80 1999 or by door manufacturer's fire door authorities. If an astragal is required, to comply with fire rated labeling requirements for pairs of fire rated doors, provide door manufacturer's standard tested astragal as required.
- J. Provide doors with minimum 1/4 inch thick edge strips, of wood species to match face veneers except as required for fire rating.
- K. Make cutouts and provide stops for glass and louvers to comply with applicable requirements of referenced standards for kind(s) of door(s) required. Install door louvers. Seal cut-outs prior to installation of moldings.
 - 1. For full light doors: Provide cut out from flush wood door, with vertical grain direction.
 - 2. Trim openings with moldings of material and profile indicated.
 - 3. Factory install louvers in prepared openings.

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 Division 8 Section 08710 "Finish Hardware".

B. Manufacturer's Written Instructions: Install wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
2. Install per all applicable codes and requirements.

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 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch 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.

a. Comply with NFPA 80 for fire-rated doors.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Ensure that smoke gaskets are in-place before prefinished door installation.

E. Protect the work of other trades damage from the installation of doors and frames.

3.3 FIELD QUALITY CONTROL

A. Lead lined openings are to be field tested by a certified independent testing agency. Any problems are to be corrected prior to the field inspection.

1. Test all openings with electrified hardware after installation to ensure proper operation.
2. Manufacturer's representative to inspect the jobsite upon substantial completion and provide a written report on any problems on the project. Provide 1 copy of this report to the material supplier, general contractor, architect, installer and the owner.

B. All discrepancies listed in the report are to be corrected prior to final acceptance.

3.4 ADJUSTING AND PROTECTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Refinish to meet Owner's approval 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 08211

SECTION 08361 – SECTIONAL OVERHEAD DOORS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes steel sectional overhead doors.
- B. See Division 5 Section 05500 “Metal Fabrications” for steel channel door frames and heads.
- C. Division 16 Sections for electrical service, connections, disconnects, and circuit breakers for powered operators, and accessories.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of components:
 - 1. Wind Load: Windspeed is 150 mph.
 - 2. Operational Life: Design components to operate for not less than 10,000 cycles.
 - a. Operation Cycle: One complete cycle begins with door in closed position. Door is then moved to open position and back to closed position.

1.4 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Submit shop drawings for review prior to fabrication. Include plans, elevations, sections, details of installation, wiring diagrams, and attachments to other Work.
 - 1. Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
- C. Samples: For each exposed finish.

1.5 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. Manufacturer: Sectional doors shall be manufactured by a firm with a minimum of five years experience in the fabrication and installation of sectional doors. Manufacturers proposed for use, which are not named in these specifications, shall (through request for pre-approval prior to receipt of bids, refer to Specification Section 01631 “Substitutions”) submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five projects of similar design and complexity completed within the past five years.

- C. Installer: Installation of sectional doors shall be performed by the authorized representative of the manufacturer.
- D. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.
- E. Pre-Installation Conference: Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Contractor shall notify Architect of conference date, time, and location and also verify receipt of approved shop drawings by installer prior to conference. Conference shall include the following attendees: Representatives for Owner, Architect, GC's project manager and site superintendent, overhead door installer's field superintendent, and any other parties involved with preparation and installation of overhead door and all accessories.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for sectional overhead door is based on Clopay Building Products, Model 3200 Grooved Polystyrene Insulated Steel Door. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. General American Door Co.
 - 2. Raynor Garage Doors.
 - 3. Overhead Door Corporation
 - 4. Pre-approved equivalents.
- B. Door Types:
 - 1. 14' wide x 14' high door with wall mounted electric motor operation.

2.2 STEEL DOOR SECTIONS

- A. General: Sectional door assembly shall be metal/foam/metal sandwich panel construction, with EPDM thermal break and ship-lap design. Units shall have the following characteristics:
 - 1. Panel Thickness: 1 5/8".
 - 2. Exterior Surface: Ribbed, textured.
 - 3. Exterior Steel: .015", hot-dipped galvanized.
 - 4. End Stiles: 16 gauge.
 - 5. Standard Springs: 10,000 cycles. (High cycles).
 - 6. Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated.
 - 7. Thermal Values: R-value of 14.86; U-value of .0067.
 - 8. Air Infiltration: 0.08 cfm at 15 mph; 0.08 cfm at 25 mph.
 - 9. Partial Glazing of Steel Panel: Insulated double strength glass.

- B. Section heights vary with manufacturers. Door thickness, other than option in paragraph above, are available from some manufacturers to accommodate thicker insulation.
- C. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints, and free of warp, twist, and deformation.
- D. Finish: Manufacturer's standard polyester or epoxy coating.
 - 1. Color and Gloss: As selected from Manufacturer's full range.

2.3 TRACKS, SUPPORTS, AND ACCESSORIES

- A. Tracks: Galvanized steel track system complying with ASTM A 653/A 653M, G60 (Z180) zinc coating, sized for door size and weight, designed for lift type indicated.
 - 1. Provide complete track assembly including brackets, bracing, and reinforcement for rigid support of ball-bearing roller guides for required door type and size.
 - 2. Slope tracks at proper angle from vertical or otherwise design to ensure tight closure at jams when door unit is closed.
 - 3. Weld or bolt to track supports.
- B. Track Reinforcement and Supports: Galvanized steel and support members, complying with ASTM A 36/A 36M and ASTM A 123. Secure, reinforce, and support tracks as required for door size and weight to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.
- C. Support and attach tracks to opening jams with continuous angle welded to tracks and attached to wall. Support sloped ceiling tracks with continuous angle welded to track and supported by laterally braced attachments to overhead structural members at curve and end of tracks. Provide "Follow the Roof" configuration.
- D. Weather-Seals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, EDPM rubber, or neoprene fitted to bottom and at top of overhead door.
 - 1. Motor-Operated Doors: With combination bottom weatherseal and pneumatic sensor edge.
 - 2. Jamb Seals: Continuous flexible seals at doorjams for weathertight installation.

2.4 HARDWARE

- A. General: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless steel, or other corrosion-resistant fasteners, to suit door type.
- B. Hinges: Heavy-duty galvanized steel hinges, of not less than 0.0747-inch thick uncoated steel, at each end stile and at each intermediate stile, per manufacturer's written recommendations for door size.
 - 1. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible.
 - 2. Use double-end hinges, where required, for doors exceeding 16 feet in width, unless otherwise recommended by door manufacturer.
- C. Rollers: Heavy-duty rollers, with steel ball bearings in case-hardened steel races, mounted with varying projections to suit slope of track.

- D. Push/Pull Handles: For push-up-operated or emergency-operated doors, galvanized steel lifting handles on each side of door.
- E. Slide Bolt: Fabricate with side locking bolts to engage through slots in tracks for locking by padlock, located on single-jamb side, operable from inside only.
- F. Power-Operated Doors: With safety interlock switch to disengage power supply when door is locked.
- G. Provide manual pull release for doors. Coordinate with users for location.

2.5 COUNTERBALANCING MECHANISM

- A. Torsion Spring: Operation by counterbalance mechanism with adjustable-tension torsion springs, fabricated from oil-tempered-steel wire complying with ASTM A 229/A 229M, Class II, mounted on cross-header tube or steel shaft. Connect to door with galvanized aircraft-type lift cables with cable safety factor of at least 5 to 1. Calibrate springs for 10,000 cycles minimum.
- B. Cable Drums: Cast-aluminum or gray-iron castings grooved to receive cable. Mount counterbalance mechanism with ball-bearing brackets at each end of shaft.
 - 1. Include one additional midpoint bracket for shafts up to 16 feet long.
 - 2. Include two additional brackets at 1/3 points to support shafts more than 16 feet long, unless closer spacing is recommended by door manufacturer.
- C. Cable Safety Device: Spring-loaded, steel or bronze cam mounted to bottom door roller assembly on each side, designed to automatically stop door if either cable breaks.
- D. Bracket: Anchor support bracket, as required to connect stationary end of spring to the wall, to level shaft and prevent sag.
- E. Spring Bumper: Include at each horizontal track to cushion door at end of opening operation.

2.6 ELECTRIC DOOR OPERATORS

- A. Electric Door Operator, General: "Liftmaster" Industrial Duty Hoist Operator, Model DH (basis-of-design), wall mounted adjacent to door wall opening. Type, size, and capacity recommended and provided by door manufacturer for door and operational life specified, with electric motor and factory pre-wired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, disconnect device, emergency auxiliary operator, and accessories required for proper operation.
 - 1. Comply with NFPA 70. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
 - 2. Provide remote operation switches for each door in the "Truck Bay" areas and "Sleeping" quarters, coordinate with the Electrical Drawings.
- B. Electric Motors: Polyphase, medium-induction type with high-starting torque, reversible, continuous-duty, Class A insulated, electric motors, complying with NEMA MG 1; with overload protection, sized to start, accelerate, and operate door in either direction, from any position, at not less than 2/3 fps or more than 1 fps, without exceeding nameplate ratings or considering service factor. Coordinate wiring requirements and electric characteristics of motors with building electrical system.

- C. Control Equipment: NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc. Provide momentary-contact, three-button control station. (Less sensitive control feature – coordinate and verify with Owner).
 - 1. Interior Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- D. Obstruction Detection Device: Provide each motorized door with self-monitoring, four-wire-configured-type, electrically actuated, external automatic safety sensor able to protect full width of door opening. Activation of sensor immediately stops and reverses downward door travel.
- E. Adjustable Limit Switches: Interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: Install door, track, and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports.
- B. Fasten vertical track assembly to framing at not less than 24 inches (600 mm) o.c. Hang horizontal track from structural overhead framing with angle or channel hangers welded and bolt fastened in place. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
- C. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.
- D. Adjust belt-driven motors as follows, if applicable:
 - 1. Use adjustable motor-mounting bases for belt-driven motors.
 - 2. Align pulleys and install belts.
 - 3. Tension belt according to manufacturer's written instructions.
- E. Verify and coordinate with the general contractor and the pre-engineered metal building manufacturer/vendor to provide all miscellaneous structural support mounting plates, brackets, anchors, etc., as necessary to wall mount motor to the building structure adjacent to each overhead sectional door.

3.2 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain doors.

END OF SECTION 08361

SECTION 08520 – ALUMINUM FIXED AND CASEMENT WINDOWS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

1.2 WORK INCLUDED

- A. Aluminum windows of type and size shown, complete with hardware, related components and accessories. Window types shall be outswinging casement, and matching fixed single window for use where fixed window appearance is to match that of casement. Glass shall be as specified under Glass and Glazing.
- B. Glass and Glazing:
 - 1. All units shall be factory glazed.
 - 2. Glass and glazing shall meet requirements as defined in 2018 IBC.
 - 3. Design pressures shall meet requirements as defined in 2018 IBC.

1.3 QUALITY ASSURANCE

- A. Manufacturer of aluminum casement & fixed windows shall have regularly and presently manufacture these windows as one of its principal products, and shall have done so for a period of not less than five (5) years. If both casement and fixed windows are required, both shall be from the same manufacturer.
- B. The window installation sub-contractor shall have installed the window type to be provided on this project, on a regular basis for a period of not less than three years.
- C. Quality Certified Labels or Certificate:
 - 1. Architectural Aluminum Manufacturers Association, "AAMA Label" affixed to each window indicating compliance with specification.
 - 2. Provide test reports from AAMA accredited laboratories certifying the performance as specified in 1.3.
 - 3. Test reports shall be accompanied by the window manufacturer's letter of certification, stating the tested window meets or exceeds the referenced criteria for the appropriate AAMA/NWWDA 101/I.S.2-93 window types.
- D. The following references shall be used as a standard of quality and performance for referenced materials:

American Architectural Manufacturers Association (AAMA):

TIR-A8-90 and Draft # 9 Structural Performance Poured Debridged Framing

American Society for Testing and Materials (ASTM):

B151-89 Copper Nickel-Zinc Alloy and Copper-Nickel Rod and

F468-90b Nonferrous Bolts, Hex Cap Screws, and Studs for General Use

F593-91 Stainless Steel Bolts, Hex Cap Screws, and Studs

B221-93 Aluminum Alloy Extruded Bars, Rods, Wire Shapes, and Tube

American Welding Society (AWS)

D 1.2-90	Structural Welding Code Aluminum
National Association of Architectural Metal Manufacturers (NAAMM):	
AMP 500	Series Metal Finishes Manual
AMP 500	Introduction to Metal Finishing
AMP 501	Finishes for Aluminum
AMP 502	Finishes for Copper Alloys
AMP 503	Finishes for Stainless Steel
AMP 504	Finishes for Carbon Steel and Iron
AMP 505	Applied Coatings

1.4 TESTING AND PERFORMANCE REQUIREMENTS

A. Test Units:

1. Air, water and structural test unit shall conform to requirements set forth in AAMA/NWWDA 101/I.S.2-93.
2. Thermal test unit sizes shall be 4'-0" x 6'0". Unit shall consist of a single in-swing casement window.

B. Test Procedures and Performances:

1. Windows shall conform to all AAMA/NWWDA 101/I.S.2-93 requirements for the window type referenced in 2.1.A. In addition, the following specific performance requirements shall be met.
2. Air Infiltration Test:
 - a. With ventilators closed and locked, test unit in accordance with ASTM E 283 at a static air pressure difference of 6.24 psf.
 - b. Air infiltration shall not exceed .10 cfm per foot of crack.
3. Water Resistance Test:
 - a. With ventilators closed and locked, test unit in accordance with ASTM E 331/ASTM E 547 at a static air pressure difference of 12 psf.
 - b. There shall be no uncontrolled water leakage.
4. Uniform Load Deflection Test:
 - a. With ventilators closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference of 60 psf positive and negative pressure.
 - b. No member shall deflect over L/175 of its span.
5. Uniform Load Structural Test:
 - a. With ventilators closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference of 90 psf, both positive and negative.
 - b. At conclusion of test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms, nor any other damage that would cause the window to be inoperable.
 - c. Hurricane-Resistance Test Performance: Provide window systems that pass large and small missile-impact tests, as required by systems' location above grade, and cyclic-pressure tests according to testing requirements of authorities having jurisdiction.
 - d. Seismic Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of

authorities having jurisdiction or ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 9, "Earthquake Loads," whichever are more stringent.

6. Condensation Resistance Test (CRT):

- a. With ventilators closed and locked, test unit in accordance with AAMA 1503.1.
- b. Condensation Resistance Factor (CRF) shall not be less than 56.

7. Thermal Transmittance Test (Conductive U-Value):

- a. With ventilators closed and locked, test unit in accordance with AAMA 1503.1.
- b. Conductive thermal transmittance (U-Value) shall not be more than 0.60 BTU/hr/ft²/°F.

8. Life Cycle Testing:

- a. Test in accordance with AAMA 910. There shall be no damage to fasteners, hardware parts, support arms, activating mechanisms, or any other damage that would cause the window to be inoperable. Air infiltration and water resistance tests shall not exceed specified requirements.

1.5 SUBMITTALS

- A. Submit shop drawings identifying parts of window units by name and kind of metal or material, show construction, locking systems, mechanical operators, trim, installation and anchorages. Include glazing details and standards for factory glazed units.
- B. Certificates: Provide certificates as specified in paragraph 1.3, including manufacturers and Installers qualifications.
- C. Samples: Provide six-inch length samples showing finishes specified.

1.6 PRODUCT HANDLING

- A. Protect windows from damage during handling and construction operations before, during and after installation.
- B. Store windows under cover, setting upright. Do not stack windows flat. Do not lay building materials or equipment on windows.

1.7 WARRANTY

- A. Provide manufacturer's warranty against malfunctions and defects, for a period of two years, including:
 - 1. Structural failures including excessive deflection, excessive leakage, or air infiltration.
 - 2. Faulty operation of sash and hardware.
 - 3. Deterioration of metals and other materials beyond normal weathering.
- B. The metal finish shall be warranted against chipping, peeling, cracking or blistering for a period of 10 years.
- C. Total Window System:
 - 1. The responsible contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total window installation which includes that of the windows, hardware, glass (including insulated units), glazing, anchorage and setting system, sealing, flashing, etc., as it relates to air, water, and structural adequacy as called for in the

- specifications and approved shop drawings.
- 2. Any deficiencies due to such elements not meeting the specifications shall be corrected by the responsible contractor at his expense during the warranty period.
- D. These warranties shall be included with other warranties presented to the owner with the closeout documents.
- E. Provide complete window systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of the latest edition and/or revisions to the 2006 International Building Code and the American Society of Civil Engineers ASCE7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procures" (for structures exceeding 60 feet in height), whichever are more stringent.
 - 1. Wind load is 150 mph.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Acceptable aluminum casement windows fixed and (provide operable "egress escape" units where indicated on the documents) shall include and be limited to the following manufacturers:
 - 1. All windows shall be PGT Industries, Inc.® Series MD-CA740-LM & SM Outswing Aluminum Casement Window as reviewed and accepted by Miami-Dade County and in compliance with the 2017 Florida Building Code, 6th Edition (basis of design).
 - 2. Or pre-approved equivalent, refer to Specification Section 01632-Request for Pre-Approvals.

2.2 MATERIAL

- A. Extruded aluminum shall be 6063-T5 or T6 alloy and tempered.
- B. Hardware:
 - 1. Furnish and install aluminum architectural windows complete with hardware and related components as shown on drawings and specified in this section
 - 2. Locking handles shall be two-point lift locks and manufactured from a white bronze alloy with a US25D brushed finish.
 - 3. Operating Hardware.
 - a. Precision machined aluminum five-knuckle butt hinges with Teflon bushings and stainless steel pins.
- C. Weather Strip:
 - 1. All weather strips shall be Santoprene® or equivalent.
- D. Thermal Barrier:
 - 1. All exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier. For purpose of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.
 - 2. The thermal barrier shall be INSULBAR® by ENSINGER, INC. or equivalent, consisting of two

glass reinforced polyamide nylon 6/6 struts, mechanically crimped in raceways extruded in the exterior and interior extrusions.

3. Poured and de-bridged urethane thermal barriers shall not be permitted.

E. Glass:

1. Glass shall be dual sealed insulated, Low-E and tinted (as selected by Architect from the manufacturer's tint options).

F. Finish Color: As selected by Architect from manufacturer's standard color selections.

G. Weatherstrips: ANSI/AAMA 101; except leaf type weatherstripping is not permitted.

H. Fasteners:

1. ANSI/AAMA 101.

- a. Use aluminum or white bronze rivets.
- b. Plated or coated materials are not acceptable, except for glazing clips.
- c. Use stainless steel fasteners for securing locks to windows.

- I. Thermal Break: Manufacturer's Standard low conductance thermal barrier, capable of structurally holding sash in position and together. All Thermal Break Assemblies (Pour & Debridge, Ensinger or others) shall comply with ASTM D638.

2.3 FABRICATION

A. Frame and Trim (includes casings, closures, and panning):

1. Fabricate to shapes shown of aluminum not less than 1.6 mm (0.062 inch) thick
2. Extruded or formed sections shall be straight, true, & smooth on exposed surfaces.
3. Exposed external corners mitered & internal corners coped; fitted with hairline joints.
4. Reinforce 0.062 inch thick members with not less than 1/8-inch thick aluminum.
5. Except for strap anchors, provide reinforcing for fasten near ends and at intervals not more than 12 inches between ends.
6. Design to allow unrestricted expansion & contraction of members and frames.
7. Secure trim to window frames with machine screws or expansion rivets.
8. Exposed screws, fasteners or pop rivets are not acceptable on exterior of the casing or trim cover system.
9. Combinations of operable and fixed units shall be accomplished by providing continuous jamb construction. No splicing shall be permitted along the entire length of the jamb. Vertical sight lines at all fixed and operable horizontals shall not exceed 3 1/2".

B. Mullions, Subsills, Stools and Receptors (provided by window manufacturer):

1. Fabricate mullions to ANSI/AAMA 101 standards.
2. Fabricate subsills and stools to shapes shown of not less than 0.08 inch thick extruded aluminum.
3. Subsills and stools shall be one-piece full length of opening with concealed anchors.
4. Sills turned up back and side edges not less than 1/4-inch. Front edge provide with drip.
5. Sill back edge behind face of window frame. Do not extend to interior surface or bridge thermal breaks.
6. Do not perforate sills for anchorage, clip screws, or other requirements.

7. Receptor system required at head and jamb. Subsill required at sill with end dams.
8. Manufacturer's standard extruded "sub-sill extender" will be acceptable.

C. Hardware (at operable casement windows - not required at fixed units):

1. Locks: Two position locking bolts or cam type tamperproof custodial locks with a single point control located not higher than five feet from floor level. Locate locking devices in the vent side rail. Fastenings for locks and keepers shall be concealed or non-removable.
2. Locking Device Strikes: Locate strikes in frame jamb. Strikes shall be adjustable for locking tension. Fabricate strikes from Type 304 stainless steel or white bronze.
3. Fabricate hinges of noncorrosive metal. Hinges may be either fully concealed when window is closed or semi-concealed with exposed knuckles. All exposed knuckle hinges shall have hospital tips, at both ends. Surface mounted hinges will not be accepted. Hinges side of window shall be as designated on drawings.
4. Hardware for Maintenance Opening of Windows: Typical opening shall be limited to the 6" open position by incorporation of a mechanical limiter. Opening beyond the six inch position shall be accomplished with a window washers key. The release device shall capture the key when window is in the open position.
5. Design operating device to prevent opening with standard tools, coins or bent wire devices.

D. Compression-Type Glazing Strips and Weatherstripping: Unless otherwise indicated, and at manufacturer's option, provide compressible stripping for glazing and weatherstripping such as molded EPDM or neoprene gaskets complying with AAMA SG-1 or with ASTM D 2000 Designation 2BC415 to 3BC620, or molded PVC gaskets complying with ASTM D 2287, or molded expanded EPDM or neoprene gaskets complying with ASTM C 509, Grade 4.

2.4 FINISH

A. All exposed framing surfaces shall be free of scratches and other serious blemishes.

B. Finish all exposed aluminum surfaces as follows:

1. High Performance Organic Finish: AA-M12-C42-R1X/AAMA-2605-98 (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 manufacturers' written instructions.
2. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, complying with AAMA 2605. Color to be selected by Architect from manufacturer's standard colors.

2.5 GLAZING

1. Factory glazing. Glaze in accordance with Glass and Glazing.
2. Windows shall be re-glazable without dismantling sash framing.
3. Design rabbet to suit glass thickness and glazing method specified.
4. Glaze from interior except where not accessible.
5. All units shall be glazed with butyl tape, silicone cap seal, and extruded snap-in aluminum glazing bead, with vinyl gasket.

2.6 PROTECTION OF ALUMINUM

A. Isolate aluminum from contact with dissimilar metals other than stainless steel, white bronze, or zinc by one of the following:

1. Coat the dissimilar metal with two coats of heavy-bodied alkali resistant bituminous paint.
2. Place caulking compound, or non-absorptive tape, or gasket between the aluminum and the dissimilar metal.
3. Paint aluminum in contact with masonry concrete and plaster, with a coat of zinc chromate primer.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Job Conditions

1. Verify that openings are dimensionally within allowable tolerances, plumb, level, clean, provide a solid anchoring surface, and are in accordance with approved shop drawings.

B. Install window units in accordance with manufacturer's specifications and recommendations for installation of window units, hardware, operators and other components of work.

C. Where type, size or spacing of fastenings for securing window accessories or equipment to building construction is not shown or specified, use expansion or toggle bolts or screws, as best suited to construction material.

1. Provide bolts or screws minimum 1/4-inch in diameter.
2. Sized and spaced to resist the tensile and shear loads imposed.
3. Use no exposed exterior fasteners unless unavoidable for application of hardware.
4. Provide non-magnetic stainless steel Phillips flat-head machine screws for exposed fasteners, where required, or special tamper-proof fasteners.
5. Locate fasteners to not disturb the thermal break construction of windows.

D. Set windows plumb, level, true, & in alignment; without warp or rack of frames or sash.

E. Anchor windows on four sides with anchor clips or fin trim.

1. Do not allow anchor clips to bridge thermal breaks.
2. Use separate clips for each side of thermal breaks.
3. Make connections to allow for thermal and other movements.
4. Do not allow building load to bear on windows.
5. Use manufacturer's standard clips at corners and not over 24 inches on center.
6. Where fin trim anchorage is shown, build into adjacent construction, anchoring at corners and not over 24 inches on center.

F. Sills and Stools:

1. Set in bed of mortar or other compound to fully support, true to line shown.
2. Do not extend sill to inside window surface or past thermal break.
3. Leave space for sealants at ends and to window frame unless shown otherwise.

G. Mullions, Closures, Trim, And Panning:

1. Cut mullion full height of opening and anchor directly to window frame on each side.
2. Closures, Trim, and Panning: External corners mitered and internal corners coped, fitted with hairline, tightly closed joints.
3. Secure to concrete or solid masonry with expansion bolts, split shank drive bolts, or powder

- actuated drive pins.
- 4. Toggle bolt to hollow masonry units. Screwed to wood or metal.
- 5. Fasten except for strap anchors, near ends and corners and at intervals not more than 12 inches between.
- 6. Seal units following installation to provide weather tight system.

3.2 ADJUST AND CLEAN

- A. Adjust ventilating sash and hardware to provide tight fit at contact points, and at weatherstripping for smooth operation and weather tight closure. Clean aluminum surfaces promptly after installation of windows, exercising care to avoid damage to protective coatings and finishes. Clean glass promptly after installation of windows. Remove excess glazing and sealant compound, dirt and other substances. Lubricate hardware and moving parts. Except when a window is being adjusted or tested, keep locked in the closed position during the progress of work on the project.

3.3 OPERATION DEVICES

- A. Provide wrenches, keys, or removable locking operating handles, as specified to operate windows with one emergency operating window key for every four windows.

END OF SECTION 08520

SECTION 08710 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
 - a. "Metal Doors and Frames"
 - b. "Flush Wood Doors"
 - c. "Stile and Rail Wood Doors"
 - d. "Interior Aluminum Doors and Frames"
 - e. "Aluminum-Framed Entrances and Storefronts"
 - f. "Stainless Steel Doors and Frames"
 - g. "Special Function Doors"
 - h. "Entrances"

1.2 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
2. NFPA 101 – Life Safety Code
3. NFPA 105 – Smoke and Draft Control Door Assemblies
4. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.3 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
 - a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
 - b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit 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.
2. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
 - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
3. Door Hardware Schedule:
 - a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
 - b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
 - c. Indicate complete designations of each item required for each opening, include:
 - 1) Door Index: door number, heading number, and Architect's hardware set number.
 - 2) Quantity, type, style, function, size, and finish of each hardware item.
 - 3) Name and manufacturer of each item.

- 4) Fastenings and other pertinent information.
- 5) Location of each hardware set cross-referenced to indications on Drawings.
- 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
- 7) Mounting locations for hardware.
- 8) Door and frame sizes and materials.
- 9) Degree of door swing and handing.

4. Key Schedule:

- a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
- b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
- c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
- d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
- e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
- f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
 - b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Final approved hardware schedule edited to reflect conditions as installed.
 - d. Final keying schedule
 - e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
 - a. Fire door assemblies, in compliance with NFPA 80.
 - b. Required egress door assemblies, in compliance with NFPA 101.

1.4 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
 - a. For door hardware: DHI certified AHC or DHC.
 - b. Can provide installation and technical data to Architect and other related subcontractors.
 - c. Can inspect and verify components are in working order upon completion of installation.
4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:

- a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
- b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:

- a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
- b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Accessibility Requirements:

- a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference

- a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

- 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
- 2) Preliminary key system schematic diagram.
- 3) Address for delivery of keys.

2. Pre-installation Conference

- a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- b. Inspect and discuss preparatory work performed by other trades.
- c. Review required testing, inspecting, and certifying procedures.
- d. Review questions or concerns related to proper installation and adjustment of door hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
- C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.6 COORDINATION\

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.7 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
 1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
 2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.

a. Mechanical Warranty

- 1) Locks
 - a) Best Cylindrical: 3 Year
- 2) Exit Devices
 - a) Von Duprin: 3 years
- 3) Closers
 - a) LCN 4050 Series: 25 years
 - b) LCN 1450 Series: 25 years
- 4) Automatic Operators
 - a) LCN: 2 years

1.8 MAINTENANCE

- A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.
- B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.2 MATERIALS

- A. Fabrication
 1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
 2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.

3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.3 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

- a. Ives 5BB series

2. Acceptable Manufacturers and Products:

- a. Hager BB1191/1279 series
 - b. McKinney TB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
 - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
 - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
 - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
 - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
5. 2 inches or thicker doors:
 - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
 - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins
 - c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins

2.4 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Best 9k Series
2. Acceptable Manufacturers and Products:
 - a. No Substitute

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
 - a. Provide levers that return to within 1/2 inch (13 mm) of door face.
 - b. Vandlgard: Provide levers with vandal resistant technology for use at heavy traffic or abusive applications.

2.5 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer and Product:
 - a. AS REQUIRED TO MATCH EXISTING
2. Acceptable Manufacturers and Products:

B. Requirements:

1. Provide cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

2.6 KEYING

A. Scheduled System:

1. Existing factory registered system:
 - a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:

a. Replaceable Construction Cores.

- 1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
 - a) 3 construction control keys
 - b) 12 construction change (day) keys.
- 2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2. Permanent Keying:

a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.

- 1) Master Keying system as directed by the Owner.

b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.

c. Provide keys with the following features:

- 1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
- 2) Patent Protection: Keys and blanks protected by one or more utility patent(s).

d. Identification:

- 1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
- 2) Identification stamping provisions must be approved by the Architect and Owner.
- 3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
- 4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
- 5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

e. Quantity: Furnish in the following quantities.

- 1) Change (Day) Keys: 3 per cylinder/core.
- 2) Permanent Control Keys: 3.
- 3) Master Keys: 6.

2.7 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

- a. LCN 4050A series
- 2. Acceptable Manufacturers and Products:
 - a. Falcon SC70A series
 - b. Sargent 351 series
- B. Requirements:
 - 1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
 - 2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
 - 3. Closer Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter heat-treated pinion journal and full complement bearings.
 - 4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and all weather requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
 - 5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
 - 6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
 - 7. Pressure Relief Valve (PRV) Technology: Not permitted.
 - 8. Provide stick on templates, special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.8 DOOR CLOSERS

- A. Manufacturers and Products:
 - 1. Scheduled Manufacturer and Product:
 - a. LCN 1450 series
 - 2. Acceptable Manufacturers and Products:
 - a. Falcon SC80A series
 - b. Sargent 1331 series
- B. Requirements:
 - 1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
 - 2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
 - 3. Closer Body: 1-3/8-inch (35 mm) diameter with 5/8-inch (16 mm) diameter pinion journal diameter heat-treated pinion journal and full complement bearings.
 - 4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
 - 5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
 - 6. Pressure Relief Valve (PRV) Technology: Not permitted.
 - 7. Provide stick on and special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.9 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
2. Acceptable Manufacturers:
 - a. Burns
 - b. Trimco

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Size plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.10 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
 - a. Glynn-Johnson
2. Acceptable Manufacturers:
 - a. Rixson
 - b. Sargent
 - c. ABH

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

2.11 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
2. Acceptable Manufacturers:
 - a. Burns
 - b. Trimco
 - c. Rockwood

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.12 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Zero International
2. Acceptable Manufacturers:
 - a. National Guard
 - b. Reese
 - c. DHSI
 - d. Legacy
 - e. Pemko

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.13 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
2. Acceptable Manufacturers:
 - a. Burns
 - b. Rockwood
 - c. Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.

3. Omit where gasketing is specified.

2.14 FINISHES

- A. FINISH: BHMA 626/652 (US26D); EXCEPT:
 1. Hinges at Exterior Doors: BHMA 630 (US32D)
 2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
 3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
 4. Protection Plates: BHMA 630 (US32D)
 5. Overhead Stops and Holders: BHMA 630 (US32D)
 6. Door Closers: Powder Coat to Match
 7. Wall Stops: BHMA 630 (US32D)
 8. Latch Protectors: BHMA 630 (US32D)
 9. Weatherstripping: Clear Anodized Aluminum
 10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.
- B. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 2. Custom Steel Doors and Frames: HMMA 831.
 3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
 4. Installation Guide for Doors and Hardware: DHI TDH-007-20
- B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
- C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

- F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
- I. Lock Cylinders:
 - 1. Install construction cores to secure building and areas during construction period.
 - 2. Replace construction cores with permanent cores as indicated in keying section.\
- J. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- K. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- L. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- M. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- N. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- O. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.3 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.4 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items per manufacturer's instructions to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.5 DOOR HARDWARE SCHEDULE

- A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
- B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
- C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
- D. Hardware Sets:

HW SET: 00

1	HARDWARE BY DOOR / FRAME MANUFACTURER	

HW SET: 01

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	KEYPAD LOCK WITH KEY OVERRIDE	45HZ7TV15KG		626	BES
1	EA	LOCK GUARD	LG12		630	IVE
1	EA	SURFACE CLOSER	4050A SCUSH		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	655A-223		A	ZER

HW SET: 02

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	73KC N 15D		630	BES
1	EA	SURFACE CLOSER	4050A EDA		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HW SET: 03

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRY LOCK	73KC AB 15D		630	BES
1	EA	WALL STOP	WS406/407CCV		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

HW SET: 04

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	73KC R 15D		630	BES
1	EA	OH STOP	90S		630	GLY
3	EA	SILENCER	SR64		GRY	IVE

HW SET: 05 - Not Used

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	SURFACE CLOSER	4050A EDA		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HW SET: 06

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK	73KC L 15D		630	BES
1	EA	WALL STOP	WS406/407CCV		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

HW SET: 07

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	73KC R 15D		630	BES
1	EA	SURFACE CLOSER	4050A EDA		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HW SET: 08

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	73KC N 15D		630	BES
1	EA	WALL STOP	WS406/407CCV		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

HW SET: 09

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	73KC N 15D		630	BES
1	EA	OH STOP	90S		630	GLY
3	EA	SILENCER	SR64		GRY	IVE

HW SET: 10

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	KEYPAD LOCK WITH KEY OVERRIDE	45HZ7TV15KG		626	BES
1	EA	SURFACE CLOSER	4050A EDA		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	545A		A	ZER

HW SET: 11

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PUSH/PULL BAR	9190-NO-10"		630	IVE
1	EA	SURFACE CLOSER	4050A EDA		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	545A		A	ZER

HW SET: 12

1	EA	CONT. HINGE	112XY EPT		628	IVE
1	EA	POWER TRANSFER	EPT10		689	VON
1	EA	ELEC PANIC HARDWARE	QEL-98-NL-OP-110MD 24 VDC		626	VON
1	EA	RIM CYLINDER	1E72		626	BES
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O		630-316	IVE
1	EA	SURFACE CLOSER	4050A SCUSH		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	655A-223		A	ZER
1		CARD READER - WORK OF DIVISION 28				
1		POWER SUPPLY - WORK OF DIVISION 28				

DOOR(S) NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL WILL MOMENTARILY UNLOCK. DOOR(S) WILL REMAIN LOCKED ON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HW SET: 13

3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	73KC D 15D		630	BES
1	EA	SURFACE CLOSER	4050 REG		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

END OF SECTION

SECTION 08800 – GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Doors.
 - 2. Glazed Entrances.
 - 3. See Drawings for Applicable Items.

1.2 DEFINITIONS

- A. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- C. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
- D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Specified Design Wind Loads: Impact rated for loads as indicated on Structural Drawings and Specifications.
 - b. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet (10 m) above grade, according to ASCE 7,

"Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

- 1) Basic Wind Speed: Refer to Structural Drawings and Specifications.
 - 2) Importance Factor: Refer to Structural Drawings and Specifications.
 - 3) Exposure Category: Refer to Structural Drawings and Specifications.
- c. Specified Design Snow Loads: As indicated on Structural Drawings and Specifications, but not less than snow loads applicable to Project as required by ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 7.0, "Snow Loads".
- d. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
- 1) Load Duration: 60 seconds or less.
- e. Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow action.
- 1) Load Duration: 30 days.
- f. Minimum Glass Thickness for Exterior Lites: As indicated but not less than 6.0 mm.
- g. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick or of thickness indicated.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite 6.0 mm thick and a nominal [1/2-inch- (12.7-mm-) wide interspace.
 4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
 - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
 - b. Solar Heat Gain Coefficient: NFRC 200.
 - c. Solar Optical Properties: NFRC 300.

1.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: 12-inch- (300-mm-) square, for each type of glass product indicated, other than monolithic clear float glass.

- C. Glazing Schedule: Use same designations indicated on Drawings.
- D. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer.

1.5 QUALITY ASSURANCE

- A. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing according to ASTM C 1087, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:
- B. Glazing for Fire-Rated Door and Window Assemblies: Glazing for assemblies that comply with NFPA 80 and 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 257.
- C. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.
- D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual".
 - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing", and AAMA TIR-A7, "Sloped Glazing Guidelines".
 - 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Sloped Glazing Guidelines".
 - 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units".
- E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the **Insulating Glass Certification Council** or **Associated Laboratories, Inc.**
- F. 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 mockups as shown on Drawings.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 Warranty

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below:
 - 1. Warranty Period: Five years from date of Substantial Completion.

- C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Products: Subject to compliance with requirements, provide one of the products specified.
 3. Product: Subject to compliance with requirements, provide product specified.
 4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 5. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 GLASS PRODUCTS

- A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.
1. Ultra-Clear (Low-Iron) Float Glass: Class I (clear); with a minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.
 - a. Products:
 - 1) AFG Industries Inc.; Krystal Klear.
 - 2) Pilkington Building Products North America; Optiwhite.
 - 3) PPG Industries, Inc.; Starphire.
 - 4) Or approved equivalent.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 3. For uncoated glass, comply with requirements for Condition A.
 4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
 5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.
- C. Coated Spandrel Float Glass: Float glass complying with other requirements specified and with the following:

1. Fallout Resistance: Provide spandrel units identical to those passing the fallout-resistance test for spandrel glass specified in ASTM C 1048.
 2. Factory apply manufacturer's standard opacifier of the following material to coated second surface of lites, with resulting products complying with Specification No. 89-1-6 in GANA Tempering Division's "Engineering Standards Manual".
 - a. Manufacturer's standard opacifier material.
 - b. Polyester film laminated to glass with solvent-based adhesive.
- D. Laminated Glass: ASTM C 1172, and complying with other requirements specified and with the following:
1. Interlayer: Polyvinyl butyral or cured resin of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
- E. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 3. Sealing System: Dual seal.
 4. Spacer Specifications: Manufacturer's standard spacer material and construction.
 5. Glass shall be Impact, Thermal Fixed configuration, dual sealed insulated, Low-E and tinted.

2.3 FIRE-RATED GLAZING PRODUCT

- A. Fire-Protection Rating: As indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Laminated Glass with Intumescent Interlayers: Proprietary Category II safety glazing product in the form of multiple lites of Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Kind FT (fully tempered) float glass laminated with intumescent interlayers; and as follows:
1. Product: Subject to compliance with requirements, "PyroStop" by Pilkington Building Products North America and distributed by Technical Glass Products.

2.4 GLAZING GASKETS

- A. Gaskets in paragraph below are for drive-in wedges or for use with pressurized stops.
- B. 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.
- C. 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.
 4. Thermoplastic polyolefin rubber.
 5. Any material indicated above.

2.5 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Single-Component Neutral-Curing Silicone Glazing Sealants:
 - a. Type and Grade: S (single component) and NS (nonsag).
 - b. Class: 100/50.
 - c. Use Related to Exposure: NT (nontraffic).
 - d. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
 - e. Applications: As required to accommodate glazing type indicated on drawings.
 2. Neutral-Curing Silicone Glazing Sealants:
 - a. Type and Grade: S (single component) and NS (nonsag).
 - b. Class: 50.
 - c. Use Related to Exposure: NT (nontraffic).
 - d. Uses Related to Glazing Substrates: [M], G, A, and, as applicable to glazing substrates indicated, O.
 - e. Applications: As required to accommodate glazing type indicated on drawings.
 3. Acid-Curing Silicone Glazing Sealants:
 - a. Type and Grade: S (single component) and NS (nonsag).
 - b. Class: 25.
 - c. Use Related to Exposure: NT (nontraffic).
 - d. Uses Related to Glazing Substrates: G, A, and, as applicable to glazing substrates indicated, O.
 - e. Applications: As required to accommodate glazing type indicated on drawings.

- C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. 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.
 - 4. Thermoplastic polyolefin rubber.
 - 5. Any material indicated above.
- C. 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.
 - 3. Silicone.
 - 4. Thermoplastic polyolefin rubber.
 - 5. Any material indicated above.
- D. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

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 for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type 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. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.8 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 GLAZING

- A. General: Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
 - 1. Glazing channel dimensions, as indicated on Drawings, 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.
 - 2. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
 - 3. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
 - 4. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
 - 5. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
 - 6. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 7. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- B. Tape Glazing: Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
 - 1. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
 - 2. 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.

3. Apply heel bead of elastomeric sealant.
 4. 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.
 5. Apply cap bead of elastomeric sealant over exposed edge of tape.
- C. Gasket Glazing (Dry): Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
1. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
 2. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
 3. Install gaskets so they protrude past face of glazing stops.
- D. Sealant Glazing (Wet): Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
1. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
 2. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.2 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces. 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 substances immediately as recommended by glass manufacturer.
- B. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 08800

SECTION 09110 – METAL LATHING SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified in this section.

1.2 WORK INCLUDED

- A. Furnish all labor and material necessary to complete installation of metal lath systems indicated, specified or both including the installation of expansion joints and metal accessories where they are attached to or are a part of this system.

1.3 QUALITY ASSURANCE

- A. All lathing shall, in addition to conforming to this specification, comply with American National Standards Institute, Inc. (ANSI) Standard Specifications A42.2, A42.3, and A42.4.

1.4 DELIVERY

- A. Deliver all manufactured materials in their original unopened packages, containers or bundles, bearing the name of the manufacturer and the brand.

1.5 STORAGE

- A. Store materials in an area providing protection from damage.

1.6 PROTECTION

- A. Provide adequate protection for surfaces that do not receive this finish.

PART 2 – PRODUCTS

2.1 METAL LATH

- A. Metal lath to be used where supports are spaced not more than 16" o.c. shall be copper alloy galvanized expanded metal lath, weighing 3.4 lbs. per sq. yd. Metal lath to be used where supports are spaced over 16" o.c. shall be copper alloy expanded galvanized metal lath stiffened with 3/8" ribs spaced 4" o.c. weighing 3.4 lbs. per sq. yd.

2.2 METAL ACCESSORIES

- A. Casing beads shall be formed of 24 ga. zinc coated steel of size and shape as detailed.
- B. Expansion joint shall be #15, with 3/4" ground formed of 26 ga. cold rolled steel and galvanized.
- C. Corner beads shall be formed of 26 ga. zinc coated steel, Type 1, by National Gypsum Company, U.S. Gypsum Company or an approved substitution.
- D. Plaster stops shall be #66 full square expanded flange for thickness of plaster indicated or specified.
- E. Hangers shall be 8 ga. galvanized wire and 16 ga. two strand or 12 ga. single strand tie wires.

PART 3 – EXECUTION

3.1 SUSPENDED CEILINGS

- A. The Contractor shall be responsible for a complete installation of the suspension system. All work shall be neatly fitted, adequately installed and fastened in place and set plumb, square, straight, level and in alignment.
- B. Main runner carrying channels shall be 1-1/2" cold rolled steel and shall be spaced not more than 48" o.c. beginning with 6" of parallel walls and supported on ends by hangers located no more than 12" from walls and securely double tied. Wire hangers shall be saddle-tied (wrapped around the main runner carrying channels).
- C. Carrying channels shall be 3/4" cold rolled steel and shall be spaced beginning within 2" from parallel walls or beams and not more than 16" o.c. Carrying channels shall be erected at right angles to main runner channels and secured at each crossing with not less than 2 strands of 16 ga. galvanized annealed wire, or formed hairpin clips of 9 ga. galvanized wire. Cross furring channel splices shall be lapped not less than 8" and securely tied. Face of member shall be trued to an accurate plane and in no instance shall main runner channels or cross furring channels be in contact abutting masonry wall or partitions.

3.2 METAL LATH APPLICATION

- A. All lath shall be applied in accordance with ASA Standard Specification for interior and exterior lathing and furring #A42.2, and shall be erected so finished plaster or stucco surfaces may be true to line and curved surfaces evenly sprung without excessive thickness of plaster or stucco.
- B. Metal lath to be applied with long dimension of sheet across supports. Secure to metal lath to supporting members with 2 turns of wire.
- C. Secure lath to supports at intervals not exceeding 8" o.c. Place tie wire where sides of sheets lap at supports.
- D. Lap lath at sides not less than 1/2" and at ends not less than 1". End laps shall occur over supports, if between supports lace with 16 ga. galvanized annealed wire.

3.3 METAL ACCESSORY APPLICATION

- A. Install casing beads where stucco or plaster stops or intersects with other materials.
- B. Install expansion joints where indicated and/or recommended by the Southeast Lathing and Plastering Bureaus, Inc.'s Standards. Do not extend metal lath continuous behind expansion joints.

END OF SECTION 09110

SECTION 09255 – GYPSUM BOARD ASSEMBLIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Gypsum board assemblies attached to metal framing.
 - 2. Corner guards.
 - 3. Sound Attenuation Blankets.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 6 Section 06105 "Miscellaneous Carpentry" for wood framing and furring, and gypsum sheathing applied over wood framing.

1.3 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.

1.4 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. See drawings for locations, if any, of assemblies requiring STC ratings.
- B. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.5 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 product specified.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
- B. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board 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.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.8 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 nonadhesive 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, manufacturers offering products that may be incorporated into the work include, but are not limited to the following:
 1. Steel Framing and Furring:
 - a. Clark Steel Framing Systems.
 - b. Consolidated Systems, Inc.
 - c. Dale Industries, Inc. – Dale/Incor.
 - d. National Gypsum Company.
 - e. Dietrich Metal Framing.
 2. Grid Suspension Assemblies:
 - a. Armstrong World Industries, Inc.
 - b. Chicago Metallic Corp.
 - c. USG Interiors, Inc.
 - d. Worthington Steel Company (formerly National Rolling Mills).
 3. Gypsum Board and Related Products:

- a. Domtar Gypsum.
 - b. Georgia-Pacific Corp.
 - c. National Gypsum Co.; Gold Bond Building Products Division.
 - d. United States Gypsum Co.
- 4. Corner Guards:
 - a. American Floor Products Co. Inc.
- B. Products: Subject to compliance with requirements, provide one of the following products where proprietary gypsum wallboard is indicated:
 - 1. Gyprock Fireguard C Gypsum Board; Domtar Gypsum.
 - 2. Firestop Type C; Georgia-Pacific Corp.
 - 3. Fire-Shield G; National Gypsum Co.; Gold Bond Building Products Division.
 - 4. SHEETROCK Brand Gypsum Panels, FIRECODE C Core; United States Gypsum Co.
 - 5. SHEETROCK Brand Gypsum Panels, ULTRACODE Core; United States Gypsum Co.
 - 6. Fiberock VHI Abuse Resistant Gypsum Panels, Type X; United States Gypsum Co.
 - 7. Fiberock Aquatough Gypsum Panels, Type X; United States Gypsum Co.
 - 8. Densglass exterior moisture resistant sheathing.

2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

- A. General: Provide components complying with ASTM C 754 for conditions indicated.
- B. Wire Ties: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.062 inch thick.
- C. Wire Hangers: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.162-inch diameter.
- D. Hanger Rods: Mild steel and zinc coated or protected with rust-inhibitive paint.
- E. Flat Hangers: Mild steel and zinc coated or protected with rust-inhibitive paint.
- F. Angle-Type Hangers: Angles with legs not less than 7/8 inch wide, formed from 0.0635-inch- thick galvanized steel sheet complying with ASTM A 653, G 90 (ASTM A 653M, Z 180) coating designation, with bolted connections and 5/16-inch diameter bolts.
- G. Channels: Cold-rolled steel, 0.0598-inch minimum thickness of base (uncoated) metal and 7/16-inch-wide flanges, and as follows:
 - 1. Carrying Channels: 1-1/2 inches deep, 475 lb/1000 feet, unless otherwise indicated.
 - 2. Furring Channels: 3/4 inch deep, 300 lb/1000 feet, unless otherwise indicated.
 - 3. Finish: ASTM A 653, G 60 (ASTM A 653M, Z 180) hot-dip galvanized coating for framing for exterior soffits and where indicated.
- H. Grid Suspension System for Interior Ceilings: ASTM C 645, manufacturer's standard direct-hung grid suspension system composed of main beams and cross-furring members that interlock to form a modular supporting network.

2.3 STEEL PARTITION AND SOFFIT FRAMING

- A. Components, General: As follows:
 - 1. Comply with ASTM C 754 for conditions indicated.

2. Steel Sheet Components: Complying with c645 requirements for metal and with ASTM A653/A 653M, G40 (Z120), hot-dip galvanized zinc coating.

B. Steel Studs and Runners: ASTM C 645.

1. Minimum Base Metal thickness: 0.027 inch.
2. Depth: 3-5/8 or 6 inches.

C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length width indicated.

1. Minimum Base Metal Thickness: 0.027 inch.

D. Cold-Rolled Channel Bridging: 0.0538-inch bare steel thickness, with minimum ½-inch wide flange.

1. Depth: 1-1/2 inches.
2. Clip Angle: 1-1/2 by 1-1/2 inch, 0.068-inch thick, galvanized steel.

E. Hat-Shaped, Rigid furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0312 inch.
2. Depth: 1-1/2 inches.

F. Z-shaped furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum bare metal thickness of 0.0179 inch and depth required too fit insulation thickness indicated.

G. Fasteners for Metal framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten members to substrates.

2.4 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.

B. Gypsum Wallboard: ASTM C 36 and as follows:

1. Type: Regular for vertical surfaces, unless otherwise indicated.
2. Type: Foil backed where indicated.
3. Type: Type X where required for fire-resistance-rated assemblies.
4. Type: Sag-resistant type for ceiling surfaces.
5. Edges: Tapered.
6. Thickness: 5/8 inch where indicated on drawings.

C. Gypsum Board Base Layer(s) for Multilayer Applications: Gypsum wallboard, ASTM C 36, and as follows:

1. Type: Regular for vertical surfaces, unless otherwise indicated.
2. Type: Foil backed where indicated.
3. Type: Type X where indicated or required for fire-resistance-rated assemblies.
4. Type: Sag-resistant type for ceiling surfaces, unless otherwise indicated.
5. Edges: Manufacturer's standard.
6. Thickness: 5/8 inch where indicated on drawings.

D. Exterior Gypsum Soffit Board: ASTM C 931, with manufacturer's standard edges, of type and thickness indicated below:

1. Type: Regular, unless otherwise indicated.
2. Type: Type X where required for fire-resistance-rated assemblies and where indicated.
3. Thickness: 5/8 inch where indicated on drawings.

E. Water-Resistant Gypsum Backing Board: ASTM C 630 and as follows:

1. Type: Regular, unless otherwise indicated.
2. Type: Type X where required for fire-resistance-rated assemblies and where indicated.
2. Thickness: 5/8 inch, where indicated on drawings.

2.5 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. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
 - d. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
 - e. One-piece control joint formed with V-shaped slot and removable strip covering slot opening.

B. Accessories for Exterior Installations: Cornerbead, edge trim, and control joints formed from steel sheet zinc coated by hot-dip process or rolled zinc complying with ASTM C 1047, in shapes indicated below by reference to Fig. 1 designations in ASTM C 1047. See drawings for locations, if any, of exterior installations..

1. Cornerbead on outside corners, unless otherwise indicated.
2. Edge trim complying with shape LC-bead per Fig. 1, unless otherwise indicated.
3. One-piece control joint formed from rolled zinc with V-shaped slot and removable strip covering slot opening.

2.6 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.

C. 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.
2. Job-Mixed Formulation: Powder product for mixing with water at Project site.
 - 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.

2.7 ACOUSTICAL SEALANT

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:
 1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.
- C. Products: Subject to compliance with requirements, provide one of the following:
 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. PL Acoustical Sealant; ChemRex, Inc.; Contech Brands.
 - b. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
 - c. SHEETROCK Acoustical Sealant; United States Gypsum Co.
 2. Acoustical Sealant for Concealed Joints:
 - a. BA-98; Pecora Corp.
 - b. Tremco Acoustical Sealant; Tremco, Inc.

2.8 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum panels.
- C. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.
- D. Fastening Adhesive for Wood: ASTM C 557.
- E. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.

- F. Steel drill screws complying with ASTM C 1002 for the following applications:
 - 1. Fastening gypsum board to steel members less than 0.033 inch thick.
 - 2. Fastening gypsum board to wood members.
 - 3. Fastening gypsum board to gypsum board.
- G. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch thick.
- H. 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, cast-in-anchors, and structural framing, with Installer present, 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 ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

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. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

3.4 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

- A. Suspend ceiling hangers from building 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 structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
 3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
 4. Secure flat, angle, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or otherwise fail.
 5. Do not attach hangers to steel deck tabs.
 6. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- B. Sway-brace suspended steel framing with hangers used for support. Install in accordance with seismic requirements of the latest edition of the Standard Building Code.
- C. Install suspended steel framing components in sizes and at spacings indicated, but not less than that required by the referenced steel framing installation standard.
1. Wire Hangers: 48 inches o.c.
 2. Carrying Channels (Main Runners): 48 inches o.c.
 3. Furring Channels (Furring Members): 16 inches o.c.
- D. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring or grid suspension members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.
- E. Wire-tie or clip furring members to main runners and to other structural supports as indicated.
- F. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. For exterior soffits, install cross-bracing and additional framing to resist wind uplift according to details on Drawings.

3.5 INSTALLING STEEL PARTITION AND SOFFIT FRAMING

- A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.
1. Where studs are installed directly against exterior walls, install foam gasket isolation strip between studs and wall.
- B. Installation tolerance: Install each steel framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate directly above suspended ceilings. Continue framing over frames for doors and openings and frames around ducts penetrating partitions above ceiling to provide support for gypsum board.
1. Cut studs 1/2 inch short of full height to provide perimeter relief.

2. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom track. Space studs as indicated by the drawings and this section.
3. For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/ceiling slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.

D. Install steel studs and furring at the following spacings:

1. Single-Layer Construction: 16 inches o.c., unless otherwise indicated.
2. Multilayer Construction: 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 panel can be attached to open (unsupported) edges of stud flanges first.

F. Z-Furring Members:

1. Erect insulation vertically and hold place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or power-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
4. Until gypsum board is installed, hold insulation in place with 10-inch staples fabricated from 0.0625-inch diameter, tie wire and inserted through slot in web of member.

3.6 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. Building is to be dried-in and conditioned prior to dry wall installation.
- B. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum panels with face side out. 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 inch of open space between panels. Do not force into place.
- E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.
- F. Attach gypsum panels to framing provided at openings and cutouts.

- G. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.
- H. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
- I. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- J. 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.
- K. 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 o.c. for vertical applications.
- L. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.7 GYPSUM BOARD APPLICATION METHODS

- A. Single-Layer Application: Install gypsum wallboard panels as follows:
 - 1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless parallel application is required for fire-resistance-rated assemblies. Use maximum-length panels to minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of board.
 - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- B. Wall Tile Substrates: For substrates indicated to receive thin-set ceramic tile and similar rigid applied wall finishes, comply with the following:
 - 1. Install water-resistant gypsum backing board panels at showers, tubs, and where indicated. Install with 1/4-inch open space where panels abut other construction or penetrations.
 - 2. Install gypsum wallboard panels with tapered edges taped and finished to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.
- C. Multilayer Application on Ceilings: Apply gypsum board indicated for base layers prior to applying base layers on walls/partitions; apply gypsum wallboard face layers in same sequence. Offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints. Apply base layers at right angles to framing members, unless otherwise indicated.
- D. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and gypsum wallboard face layers vertically (parallel to framing) with joints of base layers located over

stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints. Stagger joints on opposite sides of partitions.

E. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:

1. Fasten with screws.

F. Multilayer Fastening Methods: Apply base layers of gypsum panels and face layer to base layers as follows:

1. Fasten both base layers and face layers separately to supports with screws.

G. Direct-Bonding to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's recommendations, and temporarily brace or fasten gypsum panels until fastening adhesive has set.

H. Exterior Soffits and Ceilings: Apply exterior gypsum soffit board panels perpendicular to supports, with end joints staggered over supports.

1. Fasten with corrosion-resistant screws.

3.8 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 L-bead where edge trim can only be installed after gypsum panels are installed.
3. 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.

3.9 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. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

C. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.

D. 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.
2. Level 2 where panels form substrates for tile and where indicated.

3. Level 4 for gypsum board surfaces is required for all other areas not described in items 1. and 2. or indicated as level 5.
 4. Level 5 for gypsum board surfaces where indicated.
- E. 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.
- F. Where Level 5 gypsum board finish is indicated, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories; and apply a thin, uniform skim coat of joint compound over entire surface. For skim coat, use joint compound specified for third coat, or a product specially formulated for this purpose and acceptable to gypsum board manufacturer. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects, tool marks, and ridges and ready for decoration.
- G. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.
- H. Finish exterior gypsum soffit board using setting-type joint compounds to prefill joints and embed tape, and for first, fill (second), and finish (third) coats, with the last coat being a sandable product. Smooth each coat before joint compound hardens to minimize need for sanding. Sand between coats and after finish coat.
1. Painting exterior gypsum soffit board after finish coat has dried is specified in another Division 9 Section.
- I. Finish water-resistant gypsum backing board forming base for ceramic tile to comply with ASTM C 840 and gypsum board manufacturer's directions for treatment of joints behind tile.

3.10 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Architect will conduct an above-ceiling observation prior to installation of gypsum board ceilings and report any deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
1. Notify Architect one week in advance of the date and the time when the Project, or part of the Project, will be ready for an above-ceiling observation.
 2. Prior to notifying Architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control air tubing.
 - f. Installation of ceiling support framing.

3.11 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.

3.12 DAMAGES

- A. Contractor shall be responsible for replacement of all sections of gypsum board (full sheets floor to ceiling) in the event of damage due to moisture. Also, batt insulation (if provided) behind areas of moisture damaged gypsum board areas shall be replaced entirely. Patching, repair or partial replacement of board sheets shall not be accepted.

END OF SECTION 09255

SECTION 09256 – CEMENTITIOUS BACKER BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Wall Sheathing.
 - 2. Weather-Resistant Sheathing Barriers.
- B. Related Sections include the following:
 - 1. Section 05400 "Cold-Formed Metal Framing".
 - 2. Section 06100 "Rough Carpentry".

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI A118.9: Specification for Cementitious Backer Units.
- B. American Society for Testing and Materials:
 - 1. ASTM C 954: Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 inch to 0.110 inch in Thickness.
 - 2. ASTM C 1002: Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - 3. ASTM C 1280: Standard Specification for Application of Gypsum Sheathing.
 - 4. ASTM C 1325: Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cement Interior Substrate Sheets.
 - 5. ASTM D 226: Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
 - 6. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 7. ASTM E119: Test Method for Fire Tests of Building Construction and Materials.
 - 8. ASTM E 1677: Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls.
- C. Gypsum Association:
 - 1. GA 253: Recommended Specification for the Application of Gypsum Sheathing.

1.3 SUBMITTALS

- A. General: Submit in accordance with Section 01300 "Submittals".
- B. Product Data: Submit manufacturer's current technical literature for product specified.

1.4 QUALITY ASSURANCE

- A. Fire Resistance Rated Assembly Characteristics: Provide materials and construction identical to those tested in accordance to ASTM E 119 by an independent testing and inspection agency acceptable to authorities having jurisdiction.

1. Fire Resistance Ratings: Indicated by design designations from UL Fire Resistance Directory.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. All materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements. **WARNING:** Store all DUROCK Brand Cement Board flat. Panels are heavy and can fall over, causing serious injury or death. Do not move unless authorized.

PART 2 - PRODUCTS

2.1 WALL SHEATHING

- A. Cementitious Fiber-Mat Reinforced Sheathing: ASTM C 1325, ANSI A118.9, cementitious backer.
 1. Product: Subject to compliance with requirements, provide DUROCK Brand Cement Board by United States Gypsum Company.
 2. Type and Thickness: 1/2 inch thick.
 3. Size: 48 by 96 inches.

2.2 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and application.
- B. Nails: 11-gauge hot-dipped galvanized roofing nails 1-3/4 inch, 7/16 inch diameter head.
- C. Wood Screws: DUROCK Brand Wood or USG Sheathing WF screws 1-5/8 inch (or as required to accommodate thickness of board into framing components) with corrosion-resistant coating.
- D. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: DUROCK Brand Steel or USG Sheathing SF steel drill screws 1-5/8 inch (or as required to accommodate thickness of board into framing components) with corrosion-resistant coating.
 1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.
 2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

2.3 WEATHER-RESISTANT SHEATHING BARRIERS

- A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.
- B. Building Wrap: ASTM E 1677, Type I air retarder, with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84, UV stabilized and acceptable to authorities having jurisdiction.
 1. Products: Subject to compliance with requirements, provide Tyvek StuccoWrap by DuPont (E. I. du Pont de Nemours and Company).
- C. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.4 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film.
- B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
- C. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- D. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- E. Backer board to be provided as nailing substrate for all vertical and horizontal hard coat stucco finish systems. Backer board shall be applied over building moisture barrier and attached to exterior grade plywood sheathing over building framing.

3.3 GYPSUM SHEATHING INSTALLATION

- A. Comply with ASTM C 1280, GA-253 and manufacturer's written instructions.
 - 1. Fasten sheathing to wood framing with [nails] [screws].
 - 2. Fasten sheathing to cold-formed metal framing with screws.
 - 3. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 4. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.
- C. Horizontal Installation: Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
 - 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

- D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
 - 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

3.4 WEATHER-RESISTANT SHEATHING BARRIER INSTALLATION

- A. General: Cover framing with weather-resistant sheathing paper as follows:
 - 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.
- B. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to framing with galvanized staples or roofing nails.
- C. Building Wrap: Comply with manufacturer's written instructions.
 - 1. Seal seams, edges, fasteners, and penetrations with tape.
 - 2. Extend into jambs of openings and seal corners with tape.

3.5 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturers written instructions.
 - 1. Prime substrates as recommended by flashing manufacturer.
 - 2. Lap seams and junctures with other materials at least 4 inches, except that at flashing flanges of other construction, laps need not exceed flange width.
 - 3. Lap flashing over weather-resistant building paper at bottom and sides of openings.
 - 4. Lap weather-resistant building paper over flashing at heads of openings.
 - 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.6 PROTECTION

- A. Cementitious Fiber-Mat Reinforced Sheathing: A continuous water barrier must be installed over the studs and exterior sheathing and lap over the flashing. Weeps must be provided to allow water drainage out of the system at all horizontal terminations.

END OF SECTION 09256

SECTION 09511 – ACOUSTICAL PANEL CEILINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes ceilings consisting of acoustical panels and exposed suspension systems and seismic restraints as required by the International Building Code (IBC) latest edition.
- B. Install ceilings according to Seismic Design Category D.

1.3 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension system members.
 - 2. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96).
- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual acoustical panels or sections of acoustical panels, suspension systems, and moldings showing the full range of colors, textures, and patterns available for each type of ceiling assembly indicated.
- D. Samples for Verification: Full-size units of each type of ceiling assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
 - 1. 6-inch- (150-mm-) square samples of each acoustical panel type, pattern, and color.
 - 2. Set of 12-inch- (300-mm-) long samples of exposed suspension system members, including moldings, for each color and system type required.
- E. 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.
- F. Product Test Reports: Indicate compliance of acoustical panel ceilings and components with requirements based on comprehensive testing of current products.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed acoustical panel 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: Obtain each acoustical ceiling panel from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

- C. Source Limitations for Suspension System: Obtain each suspension system from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1. Obtain both acoustical ceiling panels and suspension system from the same manufacturer.

- D. Fire-Test-Response Characteristics: Provide acoustical panel 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 panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.

a. Smoke-Developed Index: 450 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 the 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 and inspecting agency.

- D. Seismic Standard: Comply with the following:

1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.

2. CISC's Recommendations for Acoustical Ceilings: Comply with CISC's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2".

3. CISC's Guidelines for Systems Requiring Seismic Restraint: Comply with CISC's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies--Seismic Zones 3 & 4".

4. UBC Standard 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings".

5. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads".

- E. Pre-Installation Conference:

1. Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Contractor shall notify Architect of conference date, time, and location and also verify receipt of approved shop drawings by installer prior to conference. Conference shall include the following attendees: Representatives for Owner, Architect, Engineer, GC's project manager and site superintendent, installer's field superintendent, and any other parties involved with preparation and installation of material and all accessories.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels 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 panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel 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 panels 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 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. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of amount installed.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of amount installed.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated for each designation in the Acoustical Panel Ceiling Schedule at the end of Part 3.
 - 1. Submittals must be made 10 days prior to bid date and be approved by addendum to be acceptable.
- B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Acoustical Panel Ceiling Schedule at the end of Part 3.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels 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 inches (400 mm) away from test surface per ASTM E 795.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing ASTM E 1264 pattern designations and not manufacturers' proprietary product designations,

provide products selected by Architect from each manufacturer's full range of products that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

- C. Panel Characteristics: Comply with requirements indicated in the Acoustical Panel 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 direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with 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.
 - 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are 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. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
 - 3. 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: Mild steel, zinc coated or protected with rust-inhibitive paint.
- G. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- H. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.
- 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 panel 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. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
 - 3. For narrow-face suspension systems, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.

- J. Hold-Down Clips for Non-Fire-Resistance-Rated Ceilings: For interior ceilings consisting of acoustical panels weighing less than 1 lb/sq. ft. (4.88 kg/sq. m), provide hold-down clips spaced 24 inches (610 mm) o.c. on all cross tees.
- K. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
- L. All ceiling systems must be installed in compliance with IBC 2006 requirements. Seismic Design Category D shall be used.

2.4 ACOUSTICAL SEALANT

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:
 - 1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
- C. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. PL Acoustical Sealant; Chemrex, Inc., Contech Brands.
 - b. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
 - c. SHEETROCK Acoustical Sealant; United States Gypsum Co.
 - 2. Acoustical Sealant for Concealed Joints:
 - a. BA-98; Pecora Corp.
 - b. Tremco Acoustical Sealant; Tremco, Inc.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
 - 1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel 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. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings—Seismic Zones 3-4" and IBC 2006.
- 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 to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. 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.
 - 4. 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.
 - 5. 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.
 - 7. Do not attach hangers to steel deck tabs.
 - 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 9. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m). Miter corners accurately and connect securely.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
5. Paint cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated or required.
7. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel 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 ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 ACOUSTICAL TILE CEILING SCHEDULE

- A. ACT 1 (Typical Ceiling): U.S.G. Astro Clima Plus #8221 (24" x 24" x 5/8") with 55 NRC minimum and 35 CAC, color: white. Donn DX26 heavy-duty grid with Donn 2" MS-274 seismic shadow molding. Provide 30-year written warranty against growth of mold and mildew. Ceiling must show 0% growth of mold and mildew when tested and scaled under ASTM D-3273.
- B. ACT 2 (Bathrooms): U.S.G. Pebbled #4801 (24" x 24" x 5/8") with low VOC class. Donn DX26 heavy-duty grid with Donn 2" MS-274 seismic shadow molding.

END OF SECTION 09511

SECTION 09651 - RESILIENT TILE FLOORING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Flooring and accessories as shown on the drawings and schedules and as indicated by the requirements of this section.

B. Related Documents:

1. Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 sections) apply to the work of this section.

C. Related Sections:

1. Other Division 9 sections for floor finishes related to this section but not the work of this section
2. Division 3 Section 03000 "Concrete Work"; not the work of this section.
3. Division 6 Wood and Plastics; not the work of this section.
4. Division 7 Thermal and Moisture Protection; not the work of this section.

1.2 REFERENCES

A. ASTM International:

1. ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
2. ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
3. ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
4. ASTM F 1482, Standard Guide to Wood Underlayment Products Available for Use under Resilient Flooring.
5. ASTM F 1700 Standard Specification for Solid Vinyl Tile.
6. ASTM F 1861 Standard Specification for Resilient Wall Base.
7. ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
8. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs using in situ Probes.

B. National Fire Protection Association (NFPA):

1. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
2. NFPA 258 Standard Test Method for Measuring the Smoke Generated by Solid Materials.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Provide flooring which has been manufactured, fabricated and installed to performance criteria certified by manufacturer without defects, damage, or failure.

B. Administrative Requirements:

1. Pre-Installation Meeting: Conduct an on-site pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Section 01200 "Project Meetings").
2. Pre-Installation Testing: Conduct pre-installation testing as follows: [Specify testing (i.e. moisture tests, bond test, pH test, etc.).

C. Sequencing and Scheduling:

1. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring.
2. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond, moisture tests and pH test.

1.4 SUBMITTALS

A. Tech Data:

1. Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions (latest edition of Armstrong Guaranteed Installation Systems manual, F-5061. for flooring and accessories.

B. Samples:

1. Submit the manufacturer's standard samples showing the required colors for flooring and applicable accessories.

C. MSDS:

1. Submit Material Safety Data Sheets (MSDS) available for flooring product, adhesives, patching/leveling compounds, floor finishes and cleaning agents.

D. Certifications-1:

1. If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.

E. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
2. Warranty: Warranty documents specified herein.

1.5 QUALITY ASSURANCE

A. Responsibility:

1. Single-Source Responsibility: provide types of flooring and accessories supplied by one manufacturer, including leveling and patching compounds, and adhesives.

B. Select Installer:

1. Select an installer who is competent in the installation of Armstrong resilient solid vinyl tile flooring.
2. Engage installers certified as Armstrong Commercial Certified Installers.
3. Confirm installer's certification by requesting their credentials.

C. Fire Performance Characteristics:

1. Provide resilient tile flooring with the following fire performance characteristics as determined by testing material in accordance with ASTM test methods indicated below by a certified testing laboratory or other testing agency acceptable to authorities having jurisdiction:
2. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I.
3. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply-D1:

1. Comply with Division 1 Product Requirements Sections.

B. Comply-Manufacturer:

1. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Deliverability:

1. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.

D. Storage:

1. Store materials in a clean, dry, enclosed space off the ground, protected from harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

1.7 PROJECT CONDITIONS

A. Temperature:

1. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65°F (18°C) and a maximum temperature of [100°F (38°C)][85°F (29°C)] for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55°F (13°C) in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances. Refer to the Armstrong Guaranteed Installations Systems manual, F-5061 for a complete guide on project conditions.

1.8 WARRANTY

A. Resilient:

1. Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.

B. Warranty Period:

1. Warranty Period: 10 Years.

C. Rights:

1. 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.

D. Validation:

1. For the Warranty to be valid, this product is required to be installed using the appropriate Armstrong Guaranteed Installation System. Product installed not using the specific instructions from the Guaranteed Installation System will void the warranty.

1.9 MAINTENANCE

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials from same production run as products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Quantity: Furnish quantity of flooring units equal to 5% of amount installed.
2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra material.

PART 2- PRODUCTS

2.1 MANUFACTURER

- A. Company: Resilient tile flooring, wall base, adhesives and accessories:

1. Armstrong World Industries, Inc., (Basis of Design).
2. Mannington Commercial.
3. Shaw Floors.
4. Milliken.
5. Mohawk.

2.2 RESILIENT TILE FLOORING MATERIALS

- A. Products: Provide Luxury Solid Vinyl Tile Flooring manufactured by Armstrong World Industries, Inc. (basis of Design) or equivalent.

1. Description: A layered construction consisting of a tough, clear, vinyl wear layer protecting a high-fidelity print layer on a solid vinyl backing. Protected by a UV-cured polyurethane finish, the wear surface is embossed with different textures to enhance each of the printed visuals. Colors are insoluble in water and resistant to cleaning agents and light.

2. Luxury Solid Vinyl Tile shall conform to the requirements of ASTM F 1700, "Standard Specification for Solid Vinyl Tile", Class III, Type B - Embossed Surface - Natural Creations Diamond 10, 36 x 8 x 0.125 (Basis of Design).
3. Color as selected by Architect/Owner from manufacturer's full line of color choices.

2.3 WALL BASE MATERIALS

A. WBA Top Set:

1. For top set wall base: Provide 4 in. (10.16 cm) g Color-Integrated Wall Base with a matte finish, conforming to ASTM F 1861, Type TP - Rubber, Thermoplastic, Group 1 - Solid, Style A - Straight.

2.4 ADHESIVES

A. Standard Moisture:

1. Provide Armstrong S-240 High-Performance Epoxy Adhesive] under the flooring and Armstrong S-725 Wall Base Adhesive at the wall base as recommended by the flooring manufacturer. (Basis of Design)

B. High Moisture:

1. For Tile High-Moisture Installation Warranty, Full Spread: Provide Armstrong S-543 Premium Plus Commercial Sheet Flooring Adhesive for field areas and S-725 Wall Base Adhesive at the wall base as recommended by the flooring manufacturer (Basis of Design).

2.5 ACCESSORIES

A. Patching:

1. For patching, smoothing, and leveling monolithic subfloors (concrete, terrazzo, quarry tile, ceramic tile, and certain metals), provide Armstrong [S-184 Fast-Setting Cement-Based Patch and Underlayment] [S-194 Cement-Based Patch, Underlayment and Embossing Leveler / S-195 Underlayment Additive].

B. Sealing:

1. For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.

C. Transition:

1. Provide transition/reducing strips tapered to meet abutting materials.

D. Threshold:

1. Provide threshold of thickness and width as shown on the drawings.

E. Resilient Edge Strips:

1. Provide resilient edge strips of width shown on the drawings, of equal gauge to the flooring, homogeneous vinyl or rubber composition, tapered or bullnose edge, with color to match or contrast with the flooring, or as selected by the Architect from standard colors available.

F. Metal Edge Strips:

1. Provide metal edge strips of width shown on the drawings and of required thickness to protect exposed edges of the flooring. Provide units of maximum available length to minimize the number of joints. Use butt-type metal edge strips for concealed anchorage, or overlap-type metal edge strips for exposed anchorage. Unless otherwise shown, provide strips made of extruded aluminum with a mill finish.

PART 3 – EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance:

1. Compliance: Comply with manufacturer's product data, including technical bulletins, product catalog, installation instructions, and product carton instructions for installation and maintenance procedures as needed.

3.2 EXAMINATION

A. Site Verification:

1. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions (i.e. moisture tests, bond test, pH test, etc.).

B. Visual Inspection:

1. Visually inspect flooring materials, adhesives and accessories prior to installation. Flooring material with visual defects shall not be installed and shall not be considered as a legitimate claim.

C. Examine Subfloors:

1. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.

D. Inspect Subfloors:

1. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.

E. Reporting:

1. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

F. Failure Warning:

1. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.3 PREPARATION

A. Smooth Surfaces:

1. Subfloor Preparation: Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects with S-194 Cement-Based Patch, Underlayment and Embossing Leveler / S-195 Underlayment Additive as recommended by the flooring manufacturer. Refer to Armstrong Guaranteed Installation Systems manual, F-5061 and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.

B. Subfloor Cleaning:

1. Subfloor Cleaning: Remove paint, varnish, oils, release agents, sealers, and waxes. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents. Refer to the Armstrong Guaranteed Installation Systems manual, F-5061 and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.

C. Standard Moisture Test:

1. Perform subfloor moisture testing in accordance with [ASTM F 2170, 'Standard Test Method for Determining Relative Humidity in Concrete Slabs Using in-situ Probes'] [ASTM F 1869, 'Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride'] and Bond Tests as described in publication F-5061, "Armstrong Guaranteed Installation System," to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. Relative humidity shall not exceed 80%.][MVER shall not exceed 5 lbs./1000 sq. ft./24 hrs. On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained

D. High Moisture Test:

1. [For Tile High-Moisture Installation Warranty, when using S-543 Adhesive, perform subfloor moisture testing in accordance with [ASTM F 2170, 'Standard Test Method for Determining Relative Humidity in Concrete Slabs Using in-situ Probes'] [ASTM F 1869, 'Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride'] and Bond Tests as described in publication F-5061, "Armstrong Guaranteed Installation System," to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. [Relative humidity shall not exceed 90%.] [MVER shall not exceed 7 lbs./1000 sq. ft./24 hrs.] On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained].

E. pH Test:

1. Concrete pH Testing: Perform pH tests on concrete floors regardless of their age or grade level. All test results shall be documented and retained.

F. Surface Cleaning:

1. Surface Cleaning: Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.

3.4 INSTALLATION OF FLOORING

A. F5061:

1. Install flooring in strict accordance with the latest edition of Armstrong Guaranteed Installation Systems manual, F-5061. Failure to comply may result in voiding the manufacturer's warranty listed in Section 1.08.

B. Wall-to-Wall:

1. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.

C. Pan-Type:

1. If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.

D. Scribe:

1. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.

E. Roll:

1. Roll with a 100-pound (45.36 kilogram) roller in the field areas Refer to specific rolling instructions of the flooring manufacturer.

F. Tools:

1. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

3.5 INSTALLATION OF ACCESSORIES

A. Top Set:

1. Apply top set wall base to walls, columns, casework, and other permanent fixtures in areas where top-set base is required. Install base in lengths as long as practical, with inside corners fabricated from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.

B. Voids:

1. Fill voids with plastic filler along the top edge of the resilient wall base or integral cove cap on masonry surfaces or other similar irregular substrates.

C. Resilient Edge Strips – Butted:

1. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.

D. Metal Edge Strips:

1. Apply [butt-type] [overlap] metal edge strips where shown on the drawings, [before] [after] flooring installation. Secure units to the substrate, complying with the edge strip manufacturer's recommendations.

3.6 CLEANING

3.7 PROTECTION

A. Protection:

1. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings. (See Finishing the Job in the latest edition of Armstrong Guaranteed Installation Systems manual, F-5061.)

END OF SECTION 09651

SECTION 09671 – RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. High-performance resinous flooring and all labor, materials, equipment, and services to complete the epoxy resin composition flooring with quartz aggregate and integral base as scheduled on the drawings and/or specified herein.
- B. Related Sections include the following:
 - 1. Division 3 Section 03300 "Cast-in-Place Concrete" for concrete substrates to receive resinous flooring.

1.3 SUBMITTALS

- A. Product Data: Include manufacturer's technical data, application instructions, and general recommendations for the epoxy resin composition flooring specified.
- B. Samples for Initial Selection: Submit manufacturer's color charts showing the full range of standard colors available.
- C. Samples for Verification: Of each resinous flooring system required, 6 inches square, applied by Installer for this Project to a rigid backing, in color, texture (See item C below), and finish indicated. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
- D. Texture – Contractor shall prepare 3 samples of varying roughness and convene a meeting with the local SCDHEC Representative and the Owner's Representative to gain a consensus on approved "roughness" of floor approved sample to remain in job trailer for reference during SCDHEC Final Inspection.
- E. Material Certificates: Signed by Manufacturer certifying that the epoxy resin composition flooring complies with requirements specified.
- F. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer or applicator who has a minimum of three years of experience in installing resinous flooring types similar in material, design, and extent to that indicated for this Project and who is certified by resinous flooring manufacturer.
- B. Source Limitations: Obtain epoxy resin composition flooring materials including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer. Provide secondary

materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.

- C. Field Samples: On floor area selected by Architect, provide full-thickness resinous flooring system samples that are at least 48 inches square to demonstrate texture, color, thickness, chemical resistance, cleanability, and other features of each resinous flooring system required. Simulate finished lighting conditions for review of in-place field samples.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required to execute and protect work.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring installation.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In order to define requirements for quality and function of manufactured products and requirements for performance, texture, appearance, color, and like specification requirements, the specifications written are based on resinous flooring systems by **Dex-O-Tex Product Line as manufactured by Crossfield Products Corporation**. Available Products: Subject to compliance with requirements, provide products by one of the following manufacturers or an approved equal:

1. "PaliKrom 125" by Palma Inc.
2. Dex-O-Tex "Cheminert CFS" with Quartz Aggregate (**Basis of Design**).
3. Key Resin Company "Key Quartz B-195".

2.2 MATERIALS

- A. Colors: As selected by Architect from manufacturer's standard colors.
- B. Physical Properties: Provide flooring system that meets or exceed the listed minimum physical property requirements when tested in accordance to the referenced standard test methods listed.
 1. Physical Characteristics and Technical Data:
 - a. Compressive Strength: ASTM C-579 11,000 p.s.i.
 - b. Tensile Strength: ASTM C307 2,084 p.s.i.

- c. Flexural Modulus of Elasticity (ASTM C580) 4,300 p.s.i.
- d. Water Absorption: (MIL-PRF-3134) > 1 percent max.
- e. Surface Hardness: (ASTM D2240) 85 Durometer "D".
- f. Abrasion Resistance: (ASTM D4060) 0.04 gr.
- g. Impact Resistance: (MIL-PRF-3134, Para 4.7.3) 0.024" max No chipping, cracking, or loss of adhesion.
- h. Impact Resistance: (Gardner Impact Tester) No chipping, cracking, or delamination and not more than 0.014" indentation.
- i. Adhesion: (A.C.I. Comm. No. 503.1) 400 p.s.i. (100% failure in concrete).
- j. Electrical Conductivity: (NFPA 56A) Di-electric.
- k. Flammability-Critical Radiant Flux: (ASTM E648) Greater than 1.07 watts/cm².

2.3 SUPPLEMENTAL MATERIALS

- A. Waterproofing Membrane: Type recommended or produced by manufacturer of epoxy resin composition flooring system for type of service and floor condition indicated.
- B. Textured Top Coat: Type recommended or produced by manufacturer of epoxy resin matrix flooring system for type and profile of desired final finish.
- C. Anti-Microbial Additive: Incorporate antimicrobial chemical additive to prevent growth of most bacteria, fungi, algae, and actinomycetes.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine the areas and conditions where the epoxy resin composition flooring is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.
- B. Prepare and clean substrate according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral substrate for resinous flooring application.
- C. Concrete Surfaces: Shot-blast, acid etch or power scarify as required to obtain optimum bond of flooring to concrete. Remove sufficient material to provide a sound surface free of laitance, glaze, efflorescence, and any bond-inhibiting curing compounds or form release agents. Remove grease, oil, and other penetrating contaminants. Repair damaged or deteriorated concrete to acceptable condition. Leave surface free of dust, dirt, laitance, and efflorescence.
- D. Materials: Mix resin hardener and aggregate when required, and prepare materials according to flooring system manufacturer's instructions.

3.2 APPLICATION

- A. General: Apply components of epoxy resin composition flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate and optimum intercept adhesion.

2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- B. Apply reinforcing membrane to substrate cracks, if required.
 - C. Bond Coat: Apply bond coat over prepared substrate at manufacturer's recommended spreading rate.
 - D. Body Coat: Over primer, trowel apply epoxy mortar mix at nominal 1/8" thickness; hand or power trowel. Broadcast ceramic quartz aggregate to rejection into fresh epoxy mortar basecoat.
 - E. Finish or Sealing Coats: After body coat has cured sufficiently, apply grout and finish coats of type recommended by flooring manufacturer to produce finish matching approved sample and in number of coats and spreading rates recommended by manufacturer. (Minimum of two sealer coats shall be applied. No traffic shall be allowed on sealer finish until completely cured per manufacturer's instructions.)
 1. Final finish coat shall be in color and skid retardant profile as approved by the Architect.
 2. Finish floor shall be 1/4" thick, uniform in color and free of trowel marks.
 - F. Cove Base: Apply cove base mix to wall surfaces at locations shown to form cove base height of 4 inches unless otherwise indicated. Follow manufacturer's printed instructions and details including taping, mixing, priming, troweling, sanding, and top-coating of cove base. Round internal and external corners.

3.3 FIELD QUALITY CONTROL

- A. Core Sampling: At the discretion of Owner/Architect and at locations designated by Owner/Architect, take 1 core sample per 1000 sq. ft. of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take 2 additional samples. Repair damage caused by coring and correct deficiencies at no additional cost to Owner.

3.4 CURING, CLEANING, AND PROTECTING

- A. Cure epoxy resin composition flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing the curing process. Close application area for a minimum of 24 hours.
- B. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.
- C. Clean resinous flooring not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each Project area. Use cleaning materials and procedures recommended in writing by resinous flooring manufacturer.

END OF SECTION 09671

SECTION 09675 – SYNTHETIC ATHLETIC WEIGHT ROOM FLOORING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

1.2 DESCRIPTION

- A. Related work specified under other sections.

- 1. Concrete Subfloors

- a. The general contractor shall furnish and install the concrete subfloors, preparing the floor slab to accommodate the floor system. The slab shall be steel troweled and finished smooth to a tolerance of 1/8" in any 10' radius. High spots shall be ground level, and low spots filled in with approved leveling compound. No concrete curing or hardening agents shall be applied to concrete subfloor.

- 2. Membrane Waterproofing

- a. Concrete subfloors on or below grade shall be adequately waterproofed beneath and at the perimeter walls and on earth side of below grade walls. It is the responsibility of the engineer to determine the extent of this need.

- 3. Provide transition floor strips at all door openings.

1.3 QUALITY ASSURANCE

- A. MANUFACTURER: Manufacturer of resilient flooring shall be a firm specializing in manufacturing products specified in this section. Manufacturer must be ISO 9001 certified and in the sports flooring business a minimum of 10 years.

- B. INSTALLER:

- 1. The complete installation of the flooring system, as described in the scope of these specifications, shall be carried out by an experienced installer (Flooring Contractor), and the work shall be performed in accordance with most recent installation instructions of the manufacturer.
 - 2. Installer (Flooring Contractor) shall be liable for all matters related to installation for a period of one year after the floor has been substantially installed and completed.

1.4 SUBMITTALS

- A. Submit Johnsonite "Triumph" hammered texture 3/8" square edge tile. Use Johnsonite adhesive #965.
- B. Sample - Submit one sample of specified system, if requested by Architect.
- C. Provide maintenance literature to Owner as furnished by flooring manufacturer.

1.5 WORKING CONDITIONS

- A. Synthetic materials specified herein shall not be installed until all masonry, painting, plaster, tile, marble and terrazzo work is completed, and overhead mechanical trades and painters have finished in the synthetic floor areas. The building shall be enclosed and weather tight.
- B. Permanent heat, light and ventilation shall be installed and operating during and after installation. The general contractor shall provide an area where the stored materials can be maintained at a minimum of 55 degrees and under 50% relative humidity. Ideal installation and storage conditions are the same as those which will prevail when building is occupied.
- C. Subfloors shall be clean, dry and free from dirt, dust, oil, grease, paint, alkali, concrete curing agents, hardening and parting compounds, old adhesive residue or other foreign materials. Moderate room temperature of 65 degrees or more shall be maintained for a week prior to, during and for 72 hours after installation.
- D. Flooring installation shall not begin until all sub-contract work which would cause damage, dirt, dust or interruption of normal installation pace is completed. The installation area shall be closed to all traffic and activity for a period to be set by the flooring contractor.
- E. Moisture vapor transmission of the concrete slab shall not exceed 3 lbs per 1,000 square feet in 24 hours when using the Anhydrous Calcium Chloride Test per ASTM F-1869.
- F. Environmental Limitations
 - 1. Comply with requirements of athletic flooring material supplier's requirements.
 - 2. Adhere to all MSDS requirements for materials employed in the work. Protect all persons from exposure to hazardous materials.
- G. After synthetic floors are installed and the game lines painted, area to be kept locked by general contractor to allow curing time for system. No other trades or personnel are allowed on floor until accepted by owner.

1.6 WARRANTY

- A. Provide a warranty that the materials it has supplied will be free from manufacturing defects for a period of one year. The foregoing warranty is in lieu of and excludes all other warranties not expressly set forth herein, whether expressed or implied in operation of law or otherwise, including, but not limited to, any implied warranties of merchantability or fitness. This warranty is expressly limited to the flooring materials (goods) supplied by flooring manufacturer. This warranty does not cover floor damage caused (wholly or in part) by fire, winds, floods, moisture, other unfavorable atmospheric conditions or chemical action, nor does it apply to damage caused by ordinary wear, misuse, abuse, negligent or intentional misconduct, aging, faulty building construction, concrete slab separation, faulty or unsuitable subsurface or site preparation, settlement of the building walls or faulty or unprofessional installation of the flooring systems.
- B. The flooring manufacturer shall not be liable for incidental or consequential losses, damages or expenses directly or indirectly arising from the sale, handling or use of the materials (goods) or from any other cause relating thereto, and their liability hereunder in any case is expressly limited to the replacement of materials (goods) not complying with this agreement or, at their election, to the repayment of, or crediting buyer with, an amount equal to the purchase price of such materials (goods), whether such claims are for breach of warranty or negligence. Any claim shall be deemed waived by buyer unless submitted to Johnsonite Triumph in writing within 30 days from the date buyer discovered, or should have discovered, any claimed breach.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Triumph (Basis-of-Design or pre-approved equivalent) – Prefabricated rubber sport floor mats, calandered and vulcanized with a mixture of natural and synthetic rubber. The product is manufactured in two layers which are vulcanized together.
 - 1. Tiles – 3/8" thick, 36" x 36"
 - 2. Color to be as selected by Architect from manufacturer's full range of available choices.
 - 3. Physical Properties
 - a. ASTM E-648 Class 1
 - b. ASTM E-662 <450
 - c. ASTM D 2240 Hardness 70-Shore A
 - d. ASTM D-3389 Abrasion <1.0 Gram/1,000 Cycles
- B. Johnsonite #965 adhesive or manufacturer approved adhesive – Two-component polyurethane as supplied by Connor.
- C. Base – Refer to Room Finish Schedule.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Inspect concrete slab for proper tolerance and dryness. Report any discrepancies to general contractor.
- B. Concrete slab shall be broom cleaned by general contractor.
- C. Installer (Flooring Contractor) shall approve and document all working conditions provided in General Specifications prior to commencement of installation.

3.2 INSTALLATION

- A. Tiles – install product according to Connor's written instructions.
- B. Remove all excess and waste materials from the area of work. Dispose of empty containers in accordance with federal and local statutes.
- C. Floor is to be protected as recommended by flooring material manufacturer by GC until Owner occupies the building.

END OF SECTION 09675

SECTION 09900 – PAINTING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

- A. Furnish all labor and material necessary to complete painting and finishing indicated, specified or both.

1.3 SURFACES TO BE PAINTED AND/OR FINISHED

- A. Except as otherwise specified, paint and/or finish all exposed surfaces of wood, plaster, metal, concrete masonry units, stucco, concrete, unfinished metals, structural steel, gypsum wallboard and cementitious fiber boards or other material as required to make a complete job.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Pre-Installation Conference: Conduct conference at Project site. Refer to Specification Section 01200 "Project Meetings. Paint subcontractor and paint manufacturer's representative shall attend required "pre-installation" conferences for all exposed concrete, steel, gypsum, etc., work to be finished with any of the specified paint, sealer, stain products listed to review preparation procedures of the substrate work and any requirements necessary for the substrate surface conditions for the proper application of the finished products.

1.5 JOB REQUIREMENTS

- A. The contractor shall examine the specifications for the various other trades and shall thoroughly familiarize himself with all provisions regarding their painting; the shall understand that all surfaces that are left unfinished by the requirements of other specifications shall be painted under this section. The contractor shall understand that all work specified under this section shall be in addition to shop and mill coats, priming and field coats specified in other sections.
- B. The contractor shall do all touching up of shop coats and field coats of paint on structural steel and miscellaneous steel or iron as required and/or specified.
- C. Aluminum, stainless steel, copper, bronze, chrome plate, nickel, monel metal, lead, lead coated copper and other surfaces with factory finishes shall not be painted or finished, except as otherwise specified.
- D. Contractor shall provide stenciling or signage for labeling of all fire/smoke partitions or barriers visible above any and all decorative finished ceilings and associated ceiling mounted accessories in concealed spaces on both sides of walls. Stenciling or signage shall be provided on each wall section in a space or at 30'-0" O.C. spacing for corridor lengths exceeding 30'-0" in length. Refer to drawings for identification and locations of rated partitions. Rated corridor partitions, smokestop partitions, horizontal exit partitions, exit enclosures, fire walls, etc., shall be effectively and permanently identified with signs or stenciling in a manner acceptable to the authority having

jurisdiction. Wording shall be "1 HOUR FIRE AND SMOKE BARRIER - PROTECT ALL OPENINGS". Noted rating shall be modified to indicate actual specified rating as indicated on drawings. Also provide a straight and level, 3" wide continuous painted stripe on all identified walls in concealed spaces between notations.

- E. Contractor shall schedule and coordinate a "pre-installation" conference to review requirements of the contract documents prior to start of finishing work application. Receipt of all approved shop drawings and manufacturer's data submittals by the contractor shall be completed and available at the job site prior to the conference.

1.6 ACCEPTANCE OF SURFACES

- A. The contractor shall be responsible for inspecting the work of others prior to the application of any paint or finishing materials. If any surface is not in the proper condition to receive the finishing materials specified in this section, he shall report such facts to the contractor in writing or assume the responsibility for results reasonably expected for the materials and processes specified.

1.7 DELIVERY

- A. All materials shall be delivered to the building in manufacturer's sealed packages, with labels intact and seals unbroken.

1.8 STORAGE

- A. The contractor shall be assigned a definite place for the storage of his equipment and the mixing of his materials and he shall have such place clean and in order at all times.

1.9 COLORS

- A. All paint colors shall be as selected from a complete color chip catalog submitted by the general contractor and listed on color schedule, to be issued by the architect. Do not proceed without approved schedule. Each coat of paint shall be applied in varying shades, with the final coat matching approved color selection.

PART 2 – PRODUCTS

2.1 PAINT

- A. All paint and other finishing materials shall be by the following approved manufactures:
 - 1. Sherwin Williams
 - 2. Pittsburgh
 - 3. Devoe
 - 4. Pratt and Lambert
 - 5. Porter
 - 6. Rose Talbert
 - 7. Glidden
 - 8. or other standard brands as pre-approved by the architect
- B. The manufacturer's name and the names of the products to be used in the project shall be submitted to the architect for approval prior to starting any painting work.
- C. Thinners, driers, and additives of types recommended by paint manufacturers.

- D. Shellac shall be fresh, pure, best grade dewaxed, white shellac, three pound cut.
- E. See Painting Schedule at end of this section.

PART 3 – EXECUTION

3.1 PREPARATION FOR PAINTING

- A. Surfaces to be painted shall be clean, smooth, and free from scratches and dust, thoroughly dry and well sanded before painting work is started.
- B. After the prime coat has been applied, nail holes shall be filled with putty colored to match the finish. Putty shall be brought flush with the surface of the woodwork.
- C. Knots, sap and pitch streaks in lumber that will be given a paint finish shall be brush coated with Shellac before the prime coat is applied.
- D. Before the final coat of paint is applied, surfaces shall be sanded.
- E. Concrete and masonry surfaces shall be cleaned, grouted, rubbed and pointed prior to painting.
- F. Metal surfaces shall be cleaned of rust, scale, dirt, oil and welding flux prior to painting.
- G. Woodwork to be clear and/or stain finished: Sand smooth and free of marks or discoloration; fill voids, nail holes after primer or first coat is dry, using a transparent filler compatible with finish required.

3.2 PROTECTION

- A. Fixtures and hardware shall be removed or protected during the painting operations.
- B. The contractor shall take particular care by use of clean drop cloths, masking and other suitable means, to protect adjoining surfaces, fixtures, and materials of all kinds, and shall be held responsible for and shall repair any damage resulting from the painting operations.

3.3 APPLICATION OF PAINT

- A. Paint shall be applied in the number of coats specified, which is minimum acceptable and at the square foot coverage as stated in the paint manufacturer's printed specifications. It is intended that paint so applied shall cover to the satisfaction of the architect or additional coats shall be applied at the contractor's expense until approval is obtained.
- B. Paint shall not be applied to surfaces that show a moisture content greater than 12% as determined by an electronic meter.
- C. Paint shall not be applied when the temperature falls below 45 degrees F. or in damp, rainy weather.
- D. Unless otherwise specified or approved, apply all coatings by brush; paint shall be evenly spread and well brushed. The finish coats shall be free from noticeable laps, brush marks, and streaks. (Spray or Roller Application may be approved for masonry, gypsum board and plaster after assurance of equal or better coverage can be attained).
- E. Allow each coat of paint to dry hard before applying succeeding coats.
- E. Carefully sand between coats to assure smoothness and adhesion of subsequent coats.

- G. Finish tops, bottom and edges of doors same as faces.
- H. Notify architect before applying final coats: Owner and/or architect shall have the right to change color shades before application of final coats.

3.4 BACKPAINTING

- A. All wood backs of cabinets and other wood to be placed against concrete or masonry (except pressure treated wood) shall be painted with a sealer coat of clear varnish or oil base prime coat before application.

3.5 DESTROYING WASTE

- A. At the end of each day, place in metal containers or destroy all cloths, waste materials, which have been used in preparation and application of flammable paint material. Take precautions to avoid fire by removing same from the building every night. Under no circumstances shall the contractor empty his waste in plumbing fixtures, drains, or clean-outs of the plumbing systems of the building.

3.6 TOUCHING UP AND CLEANING

- A. Upon completion, all touching-up as required shall be done and paint removed from all surfaces that are not specified to receive paint.

3.7 PAINTING SCHEDULE

- A. Following schedule is based on Sherwin-Williams products to establish a standard of quality. Surfaces shall be painted with the type paints and number of coats as hereinafter scheduled (Note: All exposed steel shall be galvanized and will not require field applied paint finish):

EXTERIOR FINISHES:

Steel/Ferrous Metal

Prime Coat: B50WZ0001 - Kem Kromik® Universal Metal Primer Off White
Notes: remove loose scale primer, address any rust issues and tough up (spot prime)

Intermediate Coat: B54W01101 - Industrial Enamel Pure White

Finish Coat: B54W01101 - Industrial Enamel Pure White

Wood (To Receive Epoxy Finish)

Prime Coat: Y24WB805 – Ex Fd Alk Pr White

Intermediate Coat: B73W00361 – Pro Industrial Waterbased Epoxy Eg-Shel (Part A) Extra White / Tint Base

Notes: Typical exterior epoxy installs to areas not direct weather exposure.

Finish Coat: B73W00361 - Pro Industrial Waterbased Epoxy Eg-Shel (Part A) Extra White / Tint Base

Notes: Typical exterior epoxy installs to areas not direct weather exposure.

INTERIOR FINISHES:

Wood (Stain Finish)

First Coat: 745000000 – MW Performance Serie

Notes: Stain Color TBD

Second Coat: 845800000 – MW Performance Serie
Notes: Fast Dry Sanding Sealer.

Third Coat: 9451000000 – MW Performance Serie
Notes: Fast-Dry Varnish

Fourth Coat: 9451000000 - MW Performance Serie
Notes: Fast-Dry Varnish

Steel/Ferrous Metal

Prime Coat: B50WZ0001 - Kem Kromik® Universal Metal Primer Off
Notes: Remove loose scale primer, address any rust issues and touch up (spot prime)

Intermediate Coat: B54W01101 PI Ind En Pure Wh.

Finish Coat: B54W01101 – PI Ind En Pure Wh

Gypsum (To Receive Eggshell Finish)

Prime Coat: B28W08601 – High Build Interior Latex Primer White

Intermediate Coat: B20W12651 - ProMar® 200 Zero VOC Interior Eg-Shel Extra White

Finish Coat: B20W12651 - ProMar® 200 Zero VOC Interior Eg-Shel Extra White

Gypsum (To Receive Epoxy Finish)

Prime Coat: B28W12600 – PM200 0 Prmr Wh

Intermediate Coat: K45W02151 - P1 Precat EG EX WH

Notes: Apply Pro Industrial 2 component (B73 Series) water based Epoxy for more impact, abrasion and Chemical resistance.

Finish Coat: K45W02151 - P1 Precat EG EX WH

Notes: Apply Pro Industrial 2 component (B73 Series) water based Epoxy for more impact, abrasion and Chemical resistance.

Concrete Block (CMU)

Prime Coat: B25W00025 - PrepRite® Interior/Exterior Latex Block Filler White
Notes: Apply Loxon Block Surfacer (A24W200) to substrate when temperatures are down to 35 degrees F or surface PH levels are higher than 8 and not exceeding 13.

Intermediate Coat: B20W12651 - ProMar® 200 Zero VOC Interior Latex Wg-Shel Extra White

Finish Coat: B20W12651 - ProMar® 200 Interior Latex Low Sheen ES Enamel Extra White.

Concrete Block (CMU to Receive Epoxy Finish)

Prime Coat: B42W00150 – PI HD Block Filler

Notes: Apply Loxon Block Surgacer (A24W200) to substrate when temperatures are down to 35 degrees F or surface PH levels are higher than 8 and nite exceeding 13.

Intermediate Coat: K45W02151 - P1 Precat EG EX WH

Apply Pro Industrial (B73 Series) water based Epoxy for more impact, abrasion and Chemical resistance.

Finish Coat: K45W02151 - P1 Precat EG EX WH

Apply Pro Industrial (B73 Series) water based Epoxy for more impact, abrasion and Chemical resistance.

Concrete Floor Sealer (General Purpose)

First Coat: 50.100304 – CLRSHLD SB CLRSLR.
Second Coat: 50.100304 – CLRSHED SB CLRSLR

Wood (To Receive Epoxy Finish)

Primer Coat: B49W00600 – EXTRM BLK ALK PR W
Intermediate Coat: B73W00361 – Pro Industrial Waterbased Epoxy Eg-Shel; (Part A) Extra
White / Tint Base
Finish Coat: B73W00361 – Pro Industrial Waterbased Epoxy Eg-Shel (Part A) Extra
White / Tint Base

;

END OF SECTION 09900

SECTION 09986 – FIBERGLASS REINFORCED PLASTIC PANELS (FRP)

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DESCRIPTION

- A. This section describes the requirements for furnishing and installing fiberglass reinforced plastic (FRP) panels according to manufacturer's recommendations.

1.3 SUBMITTALS

- A. Two approximately 8 inch by 10 inch samples of each type of panel, 10 inch length of each type of trim and molding, fastener.
- B. Shop Drawings: Indicate and dimension the location of joints and fastener attachments.
- C. Installation Guide.

1.4 QUALITY ASSURANCE

- A. Provide panels, molding, and adhesive only from the manufacturer specified to ensure warranty and color harmonization of accessories.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials
 - 1. Package sheets on skids or pallets for shipment to Project site.
 - 2. Deliver adhesive in sealed containers with labels legible and intact.
- B. Storage of Materials
 - 1. Store sheets in a dry place at the Project site for a least 48 hours prior to installation.
- C. Handling
 - 1. When moving more than a single sheet, place sheets face-to-face and back-to-back.
 - 2. Protect surface during cutting and working by application of temporary, strippable coating or by other means recommended by panel manufacturer.
 - 3. Remove foreign matter from face of panel by use of soft bristle brush, avoiding abrasive action.

1.6 PROJECT CONDITIONS

- A. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used.
- B. Allow no containers of Kemlite 101 adhesives to be opened until all potential sources of flame or spark have been shut down or extinguished and until warnings against their ignition during adhesive application have been posted.

- C. Provide ventilation to disperse fumes during application of solvent based adhesive.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Acceptable Panels: Class I/(A) Finish. Wall and/or ceiling panels shall be Kemlite Fire-X Glasbord fiberglass reinforced plastic panels as manufactured by Kemlite Company, P.O. Box 2429, Joliet, Illinois, 60434, (800) 435-0080. Color to be BES385-FX - White. Panel thickness shall be .09" or 3/32" for general purpose wall applications. Alternate products shall meet or exceed the following properties:
 - 1. U.L. Classified.
 - 2. Flame spread of 20 or lower; smoke developed 200 or lower per ASTM E-84. (the numerical flame spread rating is not intended to reflect hazards presented by this product under actual fire conditions. In a full scale fire or similar condition, all fiberglass panels will burn. Once ignited, they may burn rapidly and may release dense smoke. Fire safety requires proper design of facilities and fire suppression systems, as well as precautions during construction and occupancy.
 - 3. Barcol Hardness (scratch resistance) of 55 per ASTM D-2583.
 - 4. Impact strength (IZOD) of 12 ft. -lbs./in. per ASTM D-256.
 - 5. FMRC Approved. Subject to the conditions of approval as described in FMRC Report JI of 9A3.AM.
 - 6. USDA Acceptance.
 - 7. ICBO Report Number 4583.
- B. Moldings:
 - 1. Harmonizing PVC Moldings Available:
Color: 85 - White
- C. Sealant: Joints shall be sealed with Kemlite silicone sealant in food preparation, storage, or process areas, areas of high moisture, and in areas where steam cleaning occurs.
- D. Adhesive: As recommended by panel manufacturer for application to existing substrate.
- E. Division Bars, Corner Trim, Curbing: Panel manufacturer's standard single length extruded vinyl pieces; longest length possible to eliminate end joints.
- F. Fasteners: Non-corrosive drive rivets.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
- B. Do not commence installation until backup materials are put into satisfactory condition by this Section to receive surfacing.

3.2 APPLICATION

- A. Do all cutting with carbide tipped blades or bits.
- B. Install panels with manufacturer's recommended gap for panel field and corner joints.
- C. Fastener holes in the panels must be predrilled slightly oversized (3/8 inch diameter).
- D. Using a 1/4 inch notched trowel, apply adhesive over CMU substrate for 100 percent coverage.
- E. Using products acceptance to manufacturer, install the FRP system in accordance with manufacturer's printed instructions.

3.3 CLEANING

- A. Remove any adhesive or excessive sealant from face using solvent or cleaner recommended by panel manufacturer.

END OF SECTION 09986

SECTION 10155 – TOILET PARTITIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Provide Overhead-Braced and Floor-Anchored, Solid Phenolic Toilet Partitions and Floor Anchored Privacy Screens as indicated on Drawings and as specified herein. Grab Bars provided under Toilet and Bath Accessories.
- B. Related Sections include the following:
 - 1. Division 5 Section 05500 "Metal Fabrications" for supports that attach units to overhead structural system.
 - 2. Division 10 Section 10801 "Toilet and Bath Accessories" for toilet paper holders, grab bars, purse shelves, and similar accessories.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM).

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fasteners, and accessories.
- B. Shop Drawings: For fabrication and installation of Toilet Partition and Screen assemblies. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Initial Selection:
 - 1. Submit manufacturer's color chart with manufacturer's full range of Standard Colors. Color shall be selected on a basis of four (4) stalls or more per color.
 - 2. Submit certification that materials furnished comply with requirements specified.
- D. Samples for Verification:
 - 1. Submit 6" square Samples of each color and finish on same substrate used in work, for color verification after selections have been made.
 - 2. Submit one (1) Sample of the following:
 - a. Hardware (Complete).
 - b. Pilaster (12" X 12").
 - c. Divider Panel (12" X 12").
 - d. Continuous Aluminum Mounting Bracket (57.5").
 - e. 14 Gauge Stainless Steel Hinge.
- E. Maintenance Instructions: Provide manufacturer's printed Instructions for Maintenance of installed Work.
- F. Written Warranty: See 1.7 WARRANTY

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to Established Dimensions.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle compartments as recommended by manufacturer to protect from damage.

1.7 MANUFACTURER'S WARRANTY

- A. Provide manufacturer's written warranty on its Panels, Pilasters and Doors for twenty five (25) years, against breakage, corrosion and delamination; to be replaced without charge, excluding labor.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design: COLUMBIA PARTITIONS SUPER HD – 58133, or pre-approved equivalent, refer to Specification Section 01632 "Request for Pre-Approvals".

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. Solid Phenolic shall meet or exceed all requirements for Class "B" Flame Spread Rating calculated according to ASTM E-84-91A, and shall carry a UL Class "B" Fire Rating Certification.
- B. Material shall be Solid Phenolic with a High Pressure Melamine matte finish surface made as an integral part of the core material. Laminated surfaces are not acceptable.
 - 1. Doors – Minimum .75" (19 mm) Finished Thickness.
 - 2. Divider Panels – Minimum .50" (13 mm) Finished Thickness.
 - 3. Pilasters – Minimum .75" (19 mm) Finished Thickness.
- C. Colors: To be selected by Project Architect from Manufacturer's Standard Colors.
- D. Pilaster Shoes: ASTM A 167, Type 302/304 Stainless Steel, minimum 4" high, 18 gauge, finished with #3 Directional Polish, attached with Stainless Steel Through Bolts.
- E. Continuous Brackets: Full High (57.5") Extruded 6063-T5 Aluminum with a Satin Anodized finish. The minimum weight shall be 1.685 pounds per lineal foot. Inside of opening of Bracket shall be .50" for panels, .75" for pilasters. All holes for mounting to wall and panel/pilaster shall be pre-drilled. Holes are to be spaced at 9" O.C. along the full length of the Bracket for a total of fourteen (14) holes for mounting to the wall and seven (7) holes for mounting to the panel/pilaster. Each Bracket is to have a minimum wall thickness of .125". Each Bracket is to be packaged in a separate poly tube, and is to be labeled by stock number and manufacturer.
- F. Hinge: 14 Gauge Stainless Steel Hinge. Hinge shall be cast of Type 302/304 Stainless Steel and shall have a Satin finish. Hinge shall be gravity type for self-closing action and shall be fully adjustable

up to 360 degrees. Pivot pin shall be made of Type 302/304 Stainless Steel. Only Stainless Steel components shall be used in the construction of the Hinge. Plastic inserts are unacceptable. Hinges shall provide emergency access by lifting the door. Hinges shall be pre-drilled for mounting to door and pilaster with Stainless Steel Through-Bolts. Each Hinge is to be packaged in a separate carton, and is to be labeled by stock number, manufacturer, and left or right hand.

- G. Strike and Keeper: Heavy Duty Cast Stainless Steel with a Satin finish. The Strike and Keeper shall be 2.50" high, with the mounting holes at 1.50" O.C., and the wall thickness shall be a minimum of .125". The Strike and Keeper shall have an integral rubber bumper door stop. The stock number shall be molded into the back of the Strike and Keeper for ease in identification. Each Strike and Keeper shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one per door.
- H. Slide Latch: Heavy Duty Cast Stainless Steel with a Satin finish. The Slide Latch shall be surface mounted. The slide bar shall be .150" thick, 1.020" wide and 3.720" long. Latch shall have an internal Stainless Steel buffering spring to prevent damage when door is inadvertently slammed against the Latch. Mounting holes are to be spaced at 3.50" O.C. Latch knob is to be riveted to the slide bar and then welded to insure that the knob will not come off. The stock number is to be molded into the back of the Slide Latch for ease in identification. Each Slide Latch shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one per door.
- I. Coat Hook: Heavy Duty Cast Stainless Steel with a Satin finish. Coat Hook and Bumper shall be 2.340" high, 1.230" wide and shall protrude out from the door 3.05". The hook portion shall have a finished diameter of .250". The stock number shall be molded into the back of the Coat Hook and Bumper for ease in identification. Each Coat Hook and Bumper shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one per door.
- J. Door Stop: Heavy Duty Cast Stainless Steel with a Satin finish. Plated Zamac Door Stops are unacceptable. Door Stop shall have a 2.125" base diameter and shall protrude 1.80" from the wall. The bumper at the end of the Door Stop shall be .250" thick. The diameter of the shaft shall be .6875". The stock number shall be molded into the back of the Door Stop for ease in identification. Each Door Stop shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one for each Disabled Accessible door.
- K. Pull Handle: Heavy Duty Cast Stainless Steel with a Satin finish. Plated Zamac Door Pulls are unacceptable. Pull Handle shall protrude from the face of the door .940" and shall be 4.735" long. The Pull Handle shall have mounting holes drilled and tapped for 10/24 threads at 3.50" O.C. The Pull Handle shall be .655" wide and shall be mounted back to back with the Slide Latch. The stock number shall be molded into the back of the Pull Handle for ease in identification. Each Pull Handle shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one for each Disabled Accessible door.
- L. Overhead Bracing (Headrail): Continuous Heavy Duty Extruded 6063-T5 Aluminum Headrail with Anti-Grip profile. Headrail shall have integral reinforcing channel and curtain track. Headrail shall have a Satin Anodized finish. Provide Headrail Corner Brackets, Wall Brackets, and Headrail End Caps as required. The Headrail and Headrail Brackets shall have a minimum wall height of 2". The minimum wall thickness of the Headrail and Headrail Brackets shall be .125". Each Headrail Bracket is to be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer.
- M. Anchorages and Fasteners: All Fasteners shall be Stainless Steel with theft proof heads, Through-Bolted unless noted otherwise. Chrome plated steel or brass are not acceptable.

2.3 FABRICATION

- A. General: Provide 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 noted. Provide units with cutouts and drilled holes to receive partition-mounted hardware, accessories, and grab bars as indicated.
- B. Overhead-Braced and Floor-Anchored Partitions:
 - 1. Furnish Heavy Duty Cast Stainless Steel "Z" Bars, complete with Stainless Steel threaded rods, lock washers and leveling-adjusting nuts at pilaster, to permit structural connection at floor.
 - 2. Make provision for setting and securing continuous Extruded Aluminum Anti-Grip Headrail at top of each pilaster.
 - 3. Furnish Stainless Steel Shoe at each pilaster to conceal supports and leveling mechanism.
- C. Doors: Unless otherwise indicated, provide 24" (610 mm) wide in-swinging doors for standard Toilet Partitions and 36" (914 mm) wide out-swinging doors with a minimum 32" (813 mm) wide clear opening for Partitions indicated to be Handicapped Accessible.
- D. Floor Anchored Privacy Screens: Furnish Privacy Screens consisting of a pilaster and a panel of the same construction and finish as the Toilet Partitions. Furnish in accordance with the drawings.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install Partitions rigid, straight, plumb, and level. Provide clearances of not more than .50" (13 mm) between pilasters and panels, and not more than 1.0" (25 mm) between panels and walls. No evidence of drilling, cutting and patching shall be visible in finished work.
- B. Attach Continuous Wall Brackets to the wall with the following:
 - 1. At Solid Masonry: #14 x 1.50" long Stainless Steel Phillips Pan Head Screws and Plastic #14/16 Anchors at 9" O.C. vertical spacing.
 - 2. At Cavity Masonry: .25" diameter x required length Stainless Steel toggle bolts at 9" O.C. vertical spacing.
- C. Overhead-Braced and Floor-Anchored Partitions: Secure pilasters to floor and level, plumb, and tighten. Secure continuous Headrail to each pilaster with not less than two (2) Through-Bolted Stainless Steel fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- D. Screens: Attach with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ACCESSORIES

- A. Mount accessories to Partition units in accordance with manufacturer's instructions.

3.3 ADJUSTING AND CLEANING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation.

- B. Provide final protection and maintain conditions that ensure Toilet Partitions and Screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10155

SECTION 10350 – FLAGPOLES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Aluminum flagpoles.
- B. Related Sections include the following:
 - 1. Division 3 Section 03300 "Cast-in-Place Concrete" for concrete footings for flagpoles, if any, and if not specified in this Section.
 - 2. Division 7 Section 07920 "Joint Sealants" for elastomeric sealant filling the top of the foundation tube, if any.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide flagpoles capable of withstanding the effects of wind loads as determined according to the building code in effect for this Project or NAAMM FP 1001, "Guide Specifications for Design Loads of Metal Flagpoles", whichever is more stringent.
 - 1. Basic Wind Speed: For Project location, 130 mph (50 m/s) confirm and refer to project structural specifications.

1.4 SUBMITTALS

- A. Product Data: For each type of flagpole required. Include installation instructions.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each flagpole as a complete unit from a single manufacturer, including fittings, accessories, bases, and anchorage devices.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. General: Spiral wrap flagpoles with heavy kraft paper or other weathertight wrapping and enclose in a hard fiber tube or other protective container.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Baartol Co., Inc.
2. Concord Industries, Inc.
3. Eder Flag Manufacturing Co., Inc.
4. Ewing: John Ewing & Co. Inc.
5. ICC Manufacturing Co.; Morgan-Francis Div.; AABEC Pole Div.
6. Kearney-National Inc.; American Flagpole Div.
7. Lingo, Inc.; Acme Flagpole Co. Div.
8. Michigan Flagpole Inc.
9. Olympus Flag & Banner; EMC Div.
10. PLP Composite Technologies, Inc.

2.2 FLAGPOLES

- A. Pole Construction, General: Construct poles and ship to Project site in one piece, if possible. If more than one piece is necessary, provide snug-fitting precision joints with self-aligning, internal splicing sleeve arrangement for weathertight, hairline field joints, (visible external couplings and or connector rings or trim bands shall not be acceptable.)
- B. Aluminum Flagpoles: Fabricate from seamless, extruded tubing complying with ASTM B 241 (ASTM B 241M), alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm). Heat treat after fabrication to comply with ASTM B 597, temper T6.
 1. Provide cone-tapered aluminum flagpoles.
 2. Refer to the Architectural drawings for required height and pole diameter dimensions.
- C. Foundation Tube: Galvanized corrugated-steel foundation tube, 0.0635-inch (1.6-mm) minimum wall thickness, sized to suit flagpole and installation. Provide with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch- (19-mm-) diameter, steel ground spike; and steel centering wedges all welded together. Galvanize steel parts, including foundation tube, after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.
- D. Baseplate: Cast-metal shoe base for anchor-bolt mounting, of same metal and finish as flagpole. Provide with anchor bolts.
 1. Provide ground spike at pavement-mounted metal flagpoles.

2.3 FITTINGS

- A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match pole-butt diameter.
 1. 0.063-inch (1.6-mm) spun aluminum, finished to match flagpole.
- B. External Halyard: Ball-bearing, nonfouling, revolving truck assemblies of cast metal with continuous 5/16-inch- (8-mm-) diameter, braided polypropylene halyards and 9-inch (225-mm) cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.
 1. Provide one halyard and one cleat at each flagpole.
- C. Halyard Flag Snaps: Provide 2 swivel snap hooks per halyard, as follows:
 1. Provide with neoprene or vinyl covers.

2.4 MISCELLANEOUS MATERIALS

- A. Concrete: Comply with requirements of Division 3 Section 03300 "Cast-in-Place Concrete".
- B. Sand: ASTM C 33, fine aggregate.
- C. Elastomeric Sealant: Comply with requirements of Division 7 Section 07920 "Joint Sealants".

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Aluminum: Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
 - 1. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 606.1 or AAMA 608.1.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Prepare in-ground flagpoles by painting below-grade portions with a heavy coat of bituminous paint.
- B. Excavation: For foundation, excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.
- C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure forms, foundation tube, fiberglass sleeve, or anchor bolts in position, braced to prevent displacement during concreting.
- D. Place concrete immediately after mixing. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than 7 days or use a nonstaining curing compound.
- E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to base perimeter.

3.2 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.

END OF SECTION 10350

SECTION 10400 – IDENTIFYING DEVICES AND SIGNAGE AND GRAPHICS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SCOPE

- A. Furnish and install types of signage and graphics as specified herein. All safety and construction warning and barrier signage shall be furnished by the General Contractor in the base bid.

1.3 SUBMITTALS

- A. Furnish shop drawings, Manufacturers data and installation details, including mounting methods for various sign types. Submit sample of each sign type and color.

1.4 REGULATIONS

- A. Comply with signage requirements of ADA for message, location and mounting heights.

PART 2 – PRODUCTS

2.1 IDENTIFICATION DEVICES, SIGNAGE AND GRAPHICS

- A. Room identification signs:

1. Contractor shall provide and install interior and exterior signage as stipulated throughout these contract documents.
2. Spaces to be identified with signage: Men and Women Toilet rooms, Electrical room, Fire Sprinkler Riser room, Mechanical room.

- B. Fabricated Letters:

1. Acceptable Manufacturers: In order to define requirements for quality and function of manufactured products and requirements for sizes, gauges, grade selections, color selections and like specification requirements, the specifications as written herein are based on products of the manufacturers listed below:
 - a. BFG Industries
 - b. Colite Industries, Inc.
 - c. Ark Ramos
 - d. Gemini Signs
 - e. Metallic Arts
 - f. AOA Signs
 - g. Substitutions: Conform to Section 01631 "Substitutions".
2. Aluminum: Letters 2" to 18" size shall be cast aluminum and letters 19" and above shall be letters fabricated from .062, .080, .125 aluminum sheets. Use manufacturer's standard aluminum alloy plate stock. Hand finish edges to provide sharp, well-defined units. Furnish paint finish by Matthews or Dupont (exterior automotive grade) or equivalent, color selected from manufacturer's standard colors.

3. Letters:

- a. Provide Times New Roman Font Style for exterior and interior wall mounted letters and wall mounted street address numbers in locations and sizes indicated on the Contract Documents.

4. Mounting: Surface mount with concealed threaded studs.

C. County Seal Plaque:

1. Provide a twenty-four inch (24"), diameter plaque displaying the Horry County Seal as indicated in these contract documents. Upon request a template of the County seal along with the owner's color selections shall be provided by the Architect. Plaque to be 3" thick exterior wood material with sandblasted etched design of the County seal finished with owner's selected color choices and sealed to protect image and finish from year-round exterior climatic conditions on all surfaces. Plaque to be single sided and provided with appropriate anchors to accommodate secured wind resistant pressures and permanent anchorage to wall substrate indicated in these contract documents.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Installer must examine the substrates and conditions under which the signs are to be installed and notify the Contractor in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

3.2 INSTALLATION

- A. Verify and coordinate installation work with General Contractor schedule.
- B. Signs shall be installed in accordance with details shown on shop drawings or in accordance with manufacturer's specifications, as applicable. Install where indicated, or where directed by Architect if not shown. Install level, plumb and at proper heights. Cooperation with other trades for installation of units to finish surfaces. Repair or replace damaged units as directed by Architect.
- C. Coordinate exact locations and mounting heights required for miscellaneous support reinforcing and blocking required in stud wall and ceiling bulkhead construction prior to installation of gypsum board finish.

3.3 CLEANING AND PROTECTION

- A. At completion of installation, clean all surfaces in accordance with manufacturer's instructions. Protect units from soiling and damage until acceptance by Owner.

END OF SECTION 10400

SECTION 10505 - GEAR METAL LOCKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. 24-inch Wide Standard Gear Metal Lockers.
 - 1. With vented panel door.

1.2 REFERENCES

- A. IBC - International Building Code.

1.3 RELATED SECTIONS

- A. Section 03300 – Cast-in-Place Concrete: Concrete bases.
- B. Section 06100 – Rough Carpentry: Wood ground and furring for anchoring lockers.
- C. Section 09671 – Resinous Flooring

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- 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: Prepared specifically for this project; show dimensions of lockers and interface with other products.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns. .

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have a Quality System in place to ensure and be able to substantiate that manufactured units conform to requirements and match the approved design and must be ISO 9001:2015 certified.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Locker components shall be stored flat, if shipped unassembled, until assembly. All finishes shall be protected from soiling and damage during handling.
- 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 WARRANTY

- A. Manufacturer's standard warranty to repair or replace components of locker products that fail in materials or workmanship within 3 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Salsbury Industries, 18300 Central Avenue, Carson, CA 90746-4008; Toll Free Telephone: 1-800-LOCKERS (1-800-562-5377); Fax: 1-800-562-5399; Email: salsbury@lockers.com; Website: www.lockers.com.
- B. Or Prior Approval per Section 01632.

2.2 LOCKERS

24-inch wide standard gear metal lockers: Constructed of 16 gauge steel; durable powder coated finish; includes a lift up handle and recessed hasp for added security; can accommodate built-in combination locks, built-in key locks, factory installed resettable combination locks, combination padlocks or key padlocks.

- A. 24-inch Wide Standard Gear Metal Locker Models:

- 1. 72024: Vented door panel.

- B. Unit Width: 24 inches (610 mm).

- C. Unit Height: 72 inches (1,828 mm).

- D. Unit Depth: 18 inches (610 mm).

- E. Unit Assembly:

- 1. Assembled units.

- F. Unit Color:

- 1. Color: RED

2.3 EQUIPMENT

- A. Standard Hardware Features:

- 1. Built-In Locks (for outer door and top inside storage compartment):
Built-in combination locks.
 - 2. One 12 inch wide x 12-1/2 inch high x 13-3/4 inch deep (305 mm wide x 318 mm high x 349 mm deep) top storage compartment.
 - 3. Four wall-mounted, single-prong stainless steel coat hooks.
 - 4. One stainless steel coat rod.
 - 5. Five knuckle door hinges.
 - 6. One 13-3/4 inch (349 mm) deep upper shelf.
 - 7. One 14 inch (356 mm) high foot locker with a hinged lid, vented front panel and padlock hasp.

8. Engraved name/number plates.

2.5 CONSTRUCTION

- A. Locker Doors: Steel specially formed for added strength and rigidity and to ensure tight joints at fastening points.
 1. Door:
 - a. 16 gauge - .060 inch (1.52 mm) thick steel.
 - b. Holes provided for attaching number plates.
 2. Ventilation:
 - a. Outer door-Model # 72024: 1-1/2 inch (38 mm) wide by 3/4 inch (19 mm) high diamond-shaped perforations.
 - b. Top storage compartment: Solid facing.
 - c. Foot locker compartment: Ventilated facing.
 3. Single-point latching:
 - a. Outer door and top inside storage compartment door: Recessed handle; integral pocket and pull made of stainless steel securely fastened to door and sufficient to prevent a combination padlock, built-in combination lock, or key lock from protruding beyond door face.
 - b. Foot locker door: One-point locking device with a steel lock clip for attaching padlock.
- B. Locker Body: Solid steel specially formed for added strength and rigidity and to ensure tight joints at fastening points.
- C. Hinges:
 1. Outer door and top inside storage compartment door hinges: 0.074 inch (1.88 mm) thick sheet steel, double spun, full loop, tight pin, projection welded to door frame and securely fastened to doors; three 2 inch (51 mm) high five-knuckle hinges installed on outer door and two 2 inch (51 mm) high five-knuckle hinges installed on top inside storage compartment door.
 2. Foot locker door hinge: 16 gauge continuous hinge secured with rivets to door frame and to door. Hinge has 1/2 inch (12.7 mm) knuckles and 0.235 inch (5.969 mm) diameter.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 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 in accordance with manufacturer's installation instructions.
- B. Anchor the units to the wall studs through the locker back and to the floor.
- C. Lockers can be either floor-mounted or installed on concrete or wood bases as scheduled or indicated. Floor or base shall be level for proper installation.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 10505

SECTION 10520 – FIRE-PROTECTION SPECIALTIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Portable fire extinguishers.
 - 2. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.
- B. Related Sections include the following:
 - 1. Division 7 Section "Firestopping" for firestopping sealants at fire-rated cabinets.
 - 2. Division 9 Section 09900 "Painting" for field-painting fire-protection cabinets.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of cabinet finish indicated.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers".
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide extinguishers listed and labeled by FM.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Portable Fire Extinguishers:
 - a. J.L. Industries, Inc.
 - b. Kidde: Walter Kidde, The Fire Extinguisher Co.
 - c. Larsen's Manufacturing Company.
 - 2. Fire-Protection Cabinets:
 - a. J.L. Industries, Inc.
 - b. Larsen's Manufacturing Company.
 - c. Potter-Roemer; Div. of Smith Industries, Inc.
- B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Fire-Protection Cabinet Schedule at the end of Part 3.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality, stretcher leveled, temper rolled.
- B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
 - 1. Sheet: ASTM B 209 (ASTM B 209M).
 - 2. Extruded Shapes: ASTM B 221 (ASTM B 221M).

2.3 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.
- B. Provide cabinets and fire extinguisher as indicated on drawings
- C. See schedule for required fire extinguisher(s).
- D. Multipurpose Dry-Chemical Type: UL-rated 4-A:60-B:C, 10-lb nominal capacity, in enameled-steel container.
- E. WC-6L wet chemical for K class rating.

2.4 FIRE-PROTECTION CABINETS

- A. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

2.5 ACCESSORIES

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher, of sizes required for types and capacities of extinguishers indicated, with plated or baked-enamel finish.

1. Provide brackets for extinguishers not located in cabinets.
 2. Provide brackets for extinguishers located in cabinets.
- B. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Architect.
1. Identify bracket-mounted extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to wall surface.
 2. Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.
 - a. Application Process: Vinyl letters.
 - b. Lettering Color: Red.

2.6 COLORS AND TEXTURES

- A. Colors and Textures: As indicated by referencing manufacturer's designations.

27 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for hose valves, hose racks, and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets are to be installed.
- C. Examine fire extinguishers for proper charging and tagging.
 1. Remove and replace damaged, defective, or undercharged units.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing fire-protection specialties.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights to meet ADA guidelines.
 1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
 2. Fasten mounting brackets to structure and cabinets, square and plumb.
 3. Fasten cabinets to structure, square and plumb.

3.3 FIRE-PROTECTION CABINET SCHEDULE

- A. FE-1: Larsen's Architectural Series, aluminum, semi-recessed with rolled edge, full glass, tempered safety glass with Larsen-Loc option. Model AL2409-6R. Cabinet to have vertical letters "FIRE EXTINGUISHER". Furnish with MP10 multi-purpose dry chemical fire extinguisher and wall-mounted hanging bracket.

END OF SECTION 10520

SECTION 10801 – TOILET AND BATH ACCESSORIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Toilet And Bath Accessories.
- 2. Underlavatory Guards.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
- B. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
- C. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.
- B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.
 - 1. Products of other manufacturers with equivalent characteristics, as judged solely by Architect, may be provided.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and

run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.

- 1. Minimum Warranty Period: 5 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering accessories that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide accessories by one of the following:
 - 1. Toilet and Bath Accessories (Public Toilets):
 - a. Bradley Corporation.
 - b. Bobrick Washroom Equipment, Inc.
 - c. American Specialties, Inc.
 - d. McKinney/Parker Washroom Accessories Corp.
 - 2. Underlavatory Guards:
 - a. Brocar Products, Inc.
 - b. Truebro, Inc.
- C. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Toilet and Bath Accessory Schedule on drawings.

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings.
- C. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
- D. Galvanized Steel Sheet: ASTM A 653/A 653M, G60.
- E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.
- F. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.

- G. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
- H. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- I. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

- A. General: One, maximum 1-1/2-inch diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled.
- C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners.
- D. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
 - 1. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.
- E. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
 - 1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - 2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- F. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.
- C. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

- A. See drawings for Toilet Accessory Schedule.

END OF SECTION 10801

SECTION 11451 – RESIDENTIAL APPLIANCES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Refrigerator.
- 2. Range.
- 2. Dishwasher.
- 3. Microwave/Exhaust Hood.
- 4. Food Disposal.

- B. Related Sections include the following:

- 1. Division 15 Section for plumbing connections to residential appliances.
- 2. Division 15 Section for drainage plumbing connections to residential appliances.
- 3. Division 15 Section for kitchen sinks.
- 4. Division 16 Section for services and connections to residential appliances.

1.3 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 the same room designations shown on Drawings.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is an authorized representative of the 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 appliances 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 and models indicated. Other manufacturers' appliances with equal performance characteristics may be considered. Refer to Division 1 Section 01631 "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. AGA and ANSI Standards: Provide gas-burning appliances that carry the design certification seal of AGA and that comply with ANSI Z21-Series standards.
- G. AHAM Standards: Provide appliances that comply with the following AHAM standards:
 - 1. Refrigerators and Freezers: Total volume and shelf area ratings certified according to ANSI/AHAM HRF-1.
- H. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the Federal Trade Commission.

1.5 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.

1.6 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.
- B. Special Warranties: Written warranties, executed by manufacturer of each appliance specified agreeing to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period of manufacturer.

PART 2 – PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the appliances indicated for each designation in the Residential Appliance Schedule at the end of Part 3.

2.2 RESIDENTIAL APPLIANCES

- A. Appliances specified are models as manufactured by Frigidaire/Electrolux and Whirlpool.
 - 1. Refrigerator: Freestanding electric, top mounted freezer, listed by UL, and complying with requirements specified in the Residential Appliance Schedule.
 - 2. Electric Range: Freestanding electric slide-in range with four-burner cooktop and oven with broiler, listed by UL, and complying with requirements specified in the Residential Appliance Schedule.
 - 3. Microwave / Exhaust Hood: Built-in unit located over range with exhaust to building exterior.
 - 4. Electric Dishwasher: Slide-in under counter.
 - 5. Food Disposal.

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 white.

- 1. Color and Gloss: White

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 Divisions 15 and 16 for plumbing and electrical requirements.

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 RESIDENTIAL APPLIANCE SCHEDULE: (Contractor shall coordinate with manufacturer or supplier at time of ordering to recommend comparable replacement of any appliance specified below if "no longer available". Recommended alternate appliance's quality and size shall be equivalent to specified unit with equivalent options, accessories and also accommodate utility connections and load capacities as specified in the Contract Documents. All appliances shall be color WHITE.)

A. Refrigerator:

- 1. Refrigerator to be Whirlpool Model WRT311FZDW 20 CF Top Freezer, White. (Hinge side of door to be opposite of millwork base cabinet, refer to plans.)

B. Electric Range:

- 1. Electric Range to be Whirlpool Model WEC310SOLW 30" Drop-in, White.

C. Microwave / Range Hood:

1. Microwave / Range Hood to be Whirlpool Model WMH53521HW Built-in, White.
2. Microwave ovens with integral exhaust for installation over the cooking surface shall be listed and labeled in accordance with UL 923.

D. Food Disposal:

1. Food Disposal to be General Electric Model GFC1020F.

E. Dishwasher:

1. Dishwasher to be Whirlpool Model WDP540HMW Built-in, White.

END OF SECTION 11451

SECTION 13125 – METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

1.2 SUMMARY

- A. This Section includes: Structural framing, Roof panels, Wall panels and liners, Insulation, Building components, all Accessories and trim.
- B. See Division 3 Section "Cast-in-Place Concrete" for concrete foundations and anchor-bolt installation.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide a complete, integrated set of metal building system manufacturer's standard mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior. Include primary and secondary framing, roof and wall panels, and accessories complying with requirements indicated.
- B. Structural Performance: Provide metal building systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Engineer metal building systems according to procedures in MBMA's "Low Rise Building Systems Manual."
 - 2. Design Loads: As indicated and with load requirements in MBMA's "Low Rise Building Systems Manual.", whichever is more stringent.
- C. Seismic Performance: Design and engineer metal building systems capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project or ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads," and structural engineer's design, whichever is more stringent.
- D. Thermal Movements: Provide metal building roof and wall panel systems that allow for thermal movements resulting from maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
- E. Wind-Load and Uplift Resistance: All wind speeds and resultant wind uplift pressures shall be in accordance with ASCE 7-98 and current building codes.

1.4 SUBMITTALS

- A. Product Data: For each type of metal building system component indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, structural framing, roof and wall panel layout, and attachments to other Work.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 2. Anchor-Bolt Plans: Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.
 3. Personnel Door Schedule: Provide schedule of doors and frames, using the same reference numbers as indicated on Drawings. Include details of reinforcement and installation requirements for finish hardware and opening trim accessories.
- C. Samples: Roof panels, Wall panels, Trim and closures, Vapor retarders, Windows, and Accessories.
- D. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following: Name and location of Project, Order number, Name of manufacturer, Name of Contractor, Building dimensions, including width, length, height, and roof slope, Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard, Governing building code and year of edition, Design loads and load combinations, Building-use category, AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer, Welding certificates, Erector Certificates: Signed by manufacturer certifying that erectors comply with requirements, Manufacturer certificate, and Surveys: Show final elevations and locations of major members. Engage a qualified engineer or land surveyor to perform surveys and certify their accuracy, including certification that all building components, including roof, wall, etc. have been designed to meet or exceed the wind uplift requirements in accordance with ASCE 7-98 and current building codes.

1.5 QUALITY ASSURANCE

- A. Erector Qualifications: An experienced erector who has a minimum of five (5) years association with the Building Manufacturer that is being quoted (supplied). Builder will have experience in erecting and installing projects similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- B. Manufacturer Qualifications: A firm experienced in manufacturing metal building systems similar to those indicated for this Project and with a record of successful in-service performance.
1. Member of MBMA.
 2. AISC Certification for Category MB: An AISC-Certified Manufacturer that designs and produces metal building systems and components in an AISC-Certified Facility.
 3. Engineering Responsibility: Preparation of Shop Drawings, testing program development, test result interpretation, and comprehensive engineering analysis by a qualified professional engineer.
- C. Regulatory Requirements: Fabricate and label structural framing to comply with special inspection requirements at point of fabrication for welding and other connections required by authorities having jurisdiction.
- D. Structural Steel: Comply with AISC S335, "Specification for Structural Steel Buildings--Allowable Stress Design, Plastic Design," or AISC S342, "Load and Resistance Factor Design Specification for Structural Steel Buildings," for design requirements and allowable stresses.
- E. Cold-Formed Steel: Comply with AISI SG-671, "Specification for the Design of Cold-Formed Steel Structural Members," and AISI SG-911, "Load and Resistance Facet Design Specification for Steel Structural Members," for design requirements and allowable stresses.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store roof and wall panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.7 COORDINATION

- A. Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

1.8 WARRANTY

- A. Special Warranty on Roof and Wall Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.
- B. Special Warranty on Standing-Seam Roof Panel Weathertightness: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam roof panel assemblies that fail to remain weathertight within 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Buildings Company.
 - 2. American Steel Building Company, Inc.
 - 3. Butler Manufacturing Company.
 - 4. Gulf States Manufacturers, Inc.
 - 5. Southern Structures, Inc.
 - 6. MBCI
 - 7. Nucor
 - 8. Mesco Metal Buildings

2.2 STRUCTURAL-FRAMING MATERIALS

- A. Structural-Steel Shapes: ASTM A 36/A 36M or ASTM A 529/A 529M.
- B. Steel Plate, Bar, or Strip: ASTM A 529/A 529M, ASTM A 570/A 570M, or ASTM A 572/A 572M; 50,000-psi minimum yield strength.
- C. Steel Tubing or Pipe: ASTM A 500, Grade B; ASTM A 501; or ASTM A 53, Grade B.
- D. Structural-Steel Sheet: Hot-rolled, ASTM A 570/A 570M, Grade 50 or Grade 55; hot-rolled, ASTM 568/A 568M; or cold-rolled, ASTM A 611, structural-quality, matte (dull) finish.
- E. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 50, with G60 (Z180) coating designation; mill phosphatized.

- F. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
 - 2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating, Grade 40 (Class AZ150 coating, Grade 275); structural quality.
- G. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Hot-dip zinc coating, ASTM A 153, Class C.
- H. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Hot-dip zinc coating, ASTM A 153, Class C.
 - 2. Direct-Tension Indicators: ASTM F 959, Type 325 or Type 490 (ASTM F 959M, Type 325M or Type 490M).
 - a. Finish: Hot-dip zinc coating, ASTM B 695, Class 50.
- I. Anchor Rods, Bolts, Nuts, and Washers:
 - 1. Unheaded Rods: ASTM A 36/A 36M.
 - 2. Unheaded Bolts: ASTM A 687, high strength.
 - 3. Headed Bolts: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; and ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts and heavy hex ASTM A 490 (ASTM A 490M), Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
 - 4. Washers: ASTM A 36/A 36M.
- J. Primers: As selected by manufacturer for resistance to normal atmospheric corrosion, compatibility with finish paint systems, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
 - 1. Primer: Manufacturer's standard, lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

2.3 PANEL MATERIALS

- A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating, Grade 40 (Class AZ150 coating, Grade 275); structural quality.
 - 2. Surface: Smooth, flat, mill finish.
- B. Panel Sealants:
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.
 - 2. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant; of type, grade, class, and use classifications required to seal joints in panels and remain weathertight; and as recommended by metal building system manufacturer.

2.4 INSULATION MATERIALS

- A. Refer to Division & Section "Building Insulation." For general requirements and those specific to insulation of the office areas.
- B. Approved manufacturers:
 - 1. Johns Manville R30 "Simple Saver System"
 - 2. Refer to Section 01632 - Request For Pre-Approval to request additional approved equivalent manufactures.
- C. Glass-Fiber-Blanket Insulation: ASTM C 991, Type II thermal insulation of 0.5-lb/cu. ft. density, thickness as indicated, with a flame-spread index of 25 or less, and with 2-inch-wide, continuous, vapor-tight edge tabs. Minimum R value of 20.
 - 1. Type: II, faced one side with non-reflective vapor-retarder membrane.
- D. Vapor-Retarder Facing: ASTM C 1136.
 - 1. Composition: Vinyl-faced, scrim-reinforced foil] [Vinyl-faced, scrim-reinforced polyester.
 - 2. Permanence: Not greater than 0.02 perm when tested according to ASTM E 96, Desiccant Method.
- E. Retainer Strips: 0.019-inch-thick, formed, galvanized steel or PVC retainer clips colored to match insulation facing.

2.5 DOOR AND FRAME MATERIALS

- A. Cold-Rolled Carbon-Steel Sheet: ASTM A 366/A 366M or ASTM A 568/A 568M, matte finish, suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.
- B. Hot-Rolled Carbon-Steel Sheet: ASTM A 568/A 568M or ASTM A 569/A 569M.
- C. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, commercial quality, with G60 (Z180) coating designation; mill phosphatized.

2.6 MISCELLANEOUS MATERIALS

- A. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities, and formulated for 15-mil dry film thickness per coat.
- B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107 premixed, nonmetallic, non-corrosive, non-staining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, of consistency suitable for application, and with a 30-minute working time.
- C. Shop Primer for Galvanized Metal Surfaces: FS TT-P-641 zinc dust, zinc-oxide primer selected by manufacturer for compatibility with substrate.
- D. Finish Painting: Refer to Division 9 Sections.

2.7 FABRICATION, GENERAL

- A. Primary Framing: Shop-fabricate framing components to indicated size and section with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
1. Make shop connections by welding or by using high-strength bolts.
 2. Join flanges to webs of built-up members by a continuous submerged arc-welding process.
 3. Brace compression flange of primary framing by angles connected between frame web and purlin or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
 4. Weld clips to frames for attaching secondary framing members.
 5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary structural members with specified primer after fabrication.
 6. Coordinate with contractor(s) to provide and include all miscellaneous support plates, brackets, anchors, etc., necessary to support wall and roof frame mounted equipment including all mechanical, plumbing, electrical equipment and fixtures, overhead door tracks and wall mounted motors, etc.
- B. Secondary Framing: Shop-fabricate framing components to indicated size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
1. Make shop connections by welding or by using non-high-strength bolts.
 2. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime secondary structural members after fabrication.
- C. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer immediately after cleaning and pre-treating.
1. Prime primary, secondary, and end-wall steel framing members for a minimum dry film thickness of 1 mil.
 - a. Prime secondary steel framing formed from metallic-coated steel sheet with red-oxide polyester paint, with a minimum dry film thickness of 0.5 mil on each side.
 2. Prime galvanized members, after phosphoric acid pretreatment, with manufacturer's standard zinc dust, zinc-oxide primer.
- D. Tolerances: Comply with MBMA's "Low Rise Building Systems Manual": Chapter IV, Section 9, "Fabrication and Erection Tolerances."

2.8 STRUCTURAL FRAMING

- A. Primary Framing: Manufacturer's standard structural primary framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
 2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.
 3. Frame Configuration: Single gable.

4. Exterior Column Type: Tapered.
 5. Rafter Type: Tapered.
- B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly.
1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet; with minimum thickness of 0.0747 inch.
- C. Secondary Framing: Manufacturer's standard secondary framing members, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Fabricate framing from cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet prepainted with coil coating, unless otherwise indicated.
1. Purlins: C- or Z-shaped sections; fabricated from minimum 0.0598-inch-thick steel sheet, built-up steel plates, or structural-steel shapes; minimum 2-1/2-inch-wide flanges. Shall be per metal building manufacturer's design.
 - a. Depth: As indicated in structural drawings and details/or as design indicated by manufacturer's engineer.
 2. Girts: C- or Z-shaped sections; fabricated from minimum 0.0598-inch-thick steel sheet, built-up steel plates, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 45 to 50 degrees to flange and with minimum 2-1/2-inch-wide flanges. Shall be per metal building manufacturer's design.
 - a. Depth: As indicated in structural drawings and details.
 3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from 0.0598-inch-thick steel sheet, built-up steel plates, or structural-steel shapes; to provide adequate backup for both roof and wall panels.
 4. Flange and Sag Bracing: Minimum 1-5/8-by-1-5/8-inch structural-steel angles, with a minimum thickness of 0.0598 inch, to stiffen primary frame flanges.
 5. Base or Sill Angles or Channels: Minimum 3-by-2-by-0.0747-inch zinc-coated steel sheet.
 6. Purlin and Girt Clips: Minimum 0.0747-inch-thick, zinc-coated (galvanized) steel sheet.
 7. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from minimum 0.0747-inch-thick, zinc-coated (galvanized) steel sheet.
 8. Framing for Openings: Channel shapes; fabricated from minimum 0.0598-inch-thick, cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings, and head, jamb, and sill of other openings.
 9. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- D. Eyebrow Canopy Framing: Manufacturer's standard structural-framing system, designed to withstand required loads, fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide frames with attachment plates, diagonal wall supports, flashing, and splice members, factory drilled for field-bolted assembly as required to support and meet code requirements for external loads and fully integrated into pre-engineered metal building system.
1. Type: As indicated in structural drawings and details/ or as design indicated by manufacturer's engineer.
 2. Materials:

- a. Structure: The structure shall be framed as indicated on the drawings, and as is consistent with manufacturer's recommendations regarding design and installation from stock components.
 - b. Eyebrow canopy shall be entirely of anodized aluminum extrusions. Understructure shall consist of heli-arc welded one-piece rigid bents and the deck of interlocking anodized aluminum extrusions. The structure shall be capable of sustaining severe icing, hail, hurricane winds.
 - c. Materials: All sections shall be 6063 alloy heat-treated to a T-6 temper. Deck screws shall be type 18-8 stainless steel, sealed with neoprene "O" ring beneath stainless steel; trim rivets may be aluminum. A dip-coat of clear acrylic enamel shall insulate column ends from electrolytic reaction with grout.
 - d. Drainage: Drip edge or as recommended by manufacturer. Canopy to be installed to provide drainage away from building structure towards outer edge
 - e. Roof Deck: Extruded, self-flashing deck section interlock into a composite unit. Deck shall be staked into a camber sufficient to off-set deadload deflection and to cause positive drainage on spans over 15'-0". Staking shall consist of an abrupt local deformation of deck-lock metal, each stake having a shear value in excess of 350 pounds and shall occur as detailed.
 - f. Finish: shall consist of baked acrylic enamel, for maximum chalk and fade resistance, over chromate conversion pretreatment on deck and fascia. Fascias of canopies to be colored different from base system and match metal building trim. Bents, after solvent cleaning, shall receive one coat of vinyl wash-etch primer (Mil. #125-880) and a 1 mil. minimum coating of exterior grade, two-part, polyurethane for maximum abrasion resistance and maintainability.
 - g. Dimensions: Contractor shall field-confirm bent location, dimensions and elevations as shown on shop drawings prior to fabrication.
 - h. Erection: Sleeves (styrofoam block-outs) shall be furnished by manufacturer and set by General Contractor, manufacturer, or authorized installer, shall be scheduled to erect after all adjacent roofing and masonry have been completed. Concrete footing, anchor bolts and/or flashing, where required, shall be by others. Bents shall be carefully aligned prior to grouting; downspout column interiors shall be grouted to lower edge of "scupper"; deflectors shall be installed after grouting. All deck ends at beam joints shall be capped as detailed. Butt and miter joints shall be executed in a workmanlike manner.
- E. Bracing: Adjustable wind bracing. Windspeed is 150 MPH.
- 1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade D; or ASTM A 529/A 529M, Grade 50; 1/2-inch-diameter steel; threaded full length or threaded a minimum of 12 inches at each end.
 - 2. Cable: ASTM A 475, 1/4-inch-diameter, extra-high-strength grade, Class B zinc-coated, 7-strand steel; with threaded end anchors.
 - 3. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.
 - 4. Rigid Portal Frames: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
 - 5. Fixed-Base Columns: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
- F. Bolts: Provide shop-painted bolts unless structural-framing components are in direct contact with roof and wall panels. Provide zinc-plated bolts when structural-framing components are in direct contact with roof and wall panels.

2.9 ROOF PANELS

- A. Standing Seam Roof Panel: A mechanically seamed pan-type standing seam roof panel with concealed clips. Installed directly over purlins. Tested in accordance with ASTM E 1646 and E 1680 for water penetration and air infiltration, and per ASTM E1592 for wind uplift capacity.
 - 1. Gauge: 24(Std.).
 - 2. Dimensions: 16 inches wide by 2 inches high.
 - 3. Clips: Short Fixed.
 - 4. Finish/Color: As specified in Article 2.8 PANEL FINISH.
- B. Roof Panel Accessories: Provide components required to be supplied by same roofing system manufacturer for a complete roof panel assembly including trim, copings, fasciae, mullions, sills, corner units, ridge closures, clips, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of roof panels, unless otherwise indicated.
 - 1. Clips: Minimum 0.0625-inch-thick, stainless-steel panel clips designed to withstand negative-load requirements.
 - 2. Cleats: Mechanically seamed cleats formed from minimum 0.0250-inch-thick, stainless-steel or nylon-coated aluminum sheet.
 - 3. Thermal Spacer Blocks: Where panels attach directly to purlins, provide 1-inch-thick, thermal spacer blocks; fabricated from extruded polystyrene.
- C. Exterior Finish: Coil coating.
 - 1. Fluoropolymer System: 2-coat, thermocured system with fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, with a total minimum dry film thickness of 1 mil and 30 percent reflective gloss when tested according to ASTM D 523.
 - 2. Colors, Textures, and Glosses: As selected from manufacturer's full range and as indicated on the drawings.
 - 3. Roof and parapet wall (roof side) color finish to be galvalume.
- D. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored backer finish, consisting of prime coat and wash coat with a total minimum dry film thickness of 0.5 mil.

2.10 WALL PANELS

- A. Uninsulated Wall Panels: Manufacturer's standard panels.
 - 1. Ribbed Panels: Fabricate from metallic-coated steel sheets prepainted with coil coating, factory formed to provide 36-inch coverage, with raised trapezoidal major ribs at 12 inches o.c., and intermediate stiffening ribs symmetrically spaced between major ribs for full length of panel. Design panels for mechanical attachment to structure using exposed fasteners, lapping major ribs at panel edges.
 - a. Material: Aluminum-zinc alloy-coated steel.
 - b. Metal Thickness: 0.0179 inch.
 - c. Panel Thickness: 1.250 inches.
- B. Wall Panel Accessories: Provide components required for a complete wall panel assembly, including trim, copings, mullions, sills, corner units, clips, seam covers, battens, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.
- C. Exposed Finish for Exterior Panels: Coil coating.

1. Fluoropolymer System: 2-coat, thermocured system with fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, with a total minimum dry film thickness of 1 mil and 30 percent reflective gloss when tested according to ASTM D 523.
 2. Colors, Textures, and Glosses: As selected from manufacturer's full range and as indicated by the drawings.
- D. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored backer finish, consisting of prime coat and wash coat with a total minimum dry film thickness of 0.5 mil.

2.11 DOORS AND FRAMES

- A. Personnel Exterior Insulated Doors: Manufacturer's standard doors and frames prepared and reinforced to receive factory- and field-applied hardware according to ANSI/DHI A115 Series.
1. Steel Doors: 1-3/4 inches thick; fabricated from 0.0359-inch-thick, zinc-coated (galvanized) steel face sheets; of styles indicated. Weld 0.0598-inch-thick, inverted zinc-coated (galvanized) steel channels to face sheets at top and bottom of door.
 - a. Core: Polyurethane foam.
 2. Steel Frames: Fabricate 2-inch-wide face frames from 0.0598-inch-thick, zinc-coated (galvanized) steel sheet.
 - a. Type: Factory welded.
 3. Hardware: Refer to Division 8 Section "Finish Hardware."
 4. Anchors and Accessories: Manufacturer's standard units, galvanized according to ASTM A 123.
 5. Finishes:
 - a. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.
 - b. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat, with total minimum dry film thickness of 1 mil.
 - 1) Color and Gloss: As selected from manufacturer's full range. Match finishes of adjacent wall panels.
- B. Service Doors:
1. Refer to Division 8 Section "Sectional Overhead Doors."

2.12 WINDOWS

- A. Aluminum Windows: Refer to Specification Section 08520 - Aluminum Fixed Windows. All exterior windows shall meet current code requirements for impact resistance.
1. Window Types, Grade, and Performance Class:
 - a. Fixed Units: AAMA Grade and Performance Class HS-C20.
 2. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less

than 22,000-psi ultimate tensile strength and 0.062-inch thickness at any location for main frame and sash members.

- a. Thermally Improved Construction: Fabricate window units with an integral, concealed, low-conductance, thermal barrier; located between exterior materials and window members exposed on interior; in a manner that eliminates direct metal-to-metal contact.
3. Fasteners, Anchors, and Clips: Aluminum, nonmagnetic stainless steel, or other noncorrosive material, compatible with aluminum window members, trim, hardware, anchors, and other components of window units. Fasteners shall not be exposed, except for attaching hardware.
4. Hardware: Manufacturer's standard; of die-cast steel, malleable iron, or bronze; with steel or bronze operating arms.
5. Casement-Type Weather Stripping: AAMA 701/702 woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric.
6. Insect Screens: Removable insect screen on each operable exterior sash, with screen frame finished to match window unit, and wire fabric mesh of 0.013-inch-diameter, coated aluminum wire.
7. Baked-Enamel Finish: Thermosetting, modified-acrylic enamel system complying with AAMA 603.8 except with a minimum dry film thickness of 0.7 mil, medium gloss on exposed areas.
 - a. Color: As selected from manufacturer's full range.
- B. Glazing: Manufacturer's standard double insulated units for new and existing structure where metal skin is new or replaced.
 1. Preglazed Fabrication: Preglaze window units at the factory to greatest extent possible and practical for applications indicated.

2.13 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer. Provide sheet metal accessories of same material and in same finish as roof and wall panels, 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. Provide fasteners with heads matching color of roof or wall sheets by means of plastic caps or factory-applied coating.
 1. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 2. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
- C. Flashing and Trim: Form from 0.024-inch-thick, zinc-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent roof or wall panels.
 1. Opening Trim: Minimum 0.028-inch-thick steel sheet. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
- D. Gutters: Form from .050 thick aluminum sheet prepainted with coil coating. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in maximum length sections, sized according to SMACNA's "Architectural Sheet Metal

Manual" and as indicated by the drawings. Furnish gutter supports spaced 36 inches o.c., fabricated from same metal as gutters. Provide bronze, copper, or aluminum wire ball strainers at outlets. Finish gutters to match roof fascia and rake trim.

- E. Downspouts: Form from .050 thick aluminum sheet prepainted with coil coating; in maximum length sections, complete with formed elbows and offsets. Finish downspouts to match wall panels.
- F. Extra Paint: Metal building manufacturer is to provide ten (10) gallons of paint that matches selected metal skin color and finish. Paint to be used on existing doors and frames and other areas as appropriate. Contact Owner/Architect for exact color to be used.
- G. Contractor shall provide one (1) 15'-0" x 4'-0" and four (4) 5'-0" x 4'-0" prefabricated, prefinished metal wall hung canopies and all associated drainage components, accessories and mounting anchors, etc., as indicated on the documents. The main building structure shall be engineered as necessary to support each unit where located above each exterior door except main front entrance including providing all necessary miscellaneous framing integrated into the building framing system. Contractor shall complete field installation of all canopies except the unit above Door 109 from Corridor 109. This canopy unit shall not be installed under this contract and the unit and all accessories shall be given to the county for future installation by other parties.

2.14 SOURCE QUALITY CONTROL

- A. Fabrication will be performed by a fabricator registered and approved by authorities having jurisdiction to perform such work without special inspection.

PART 3 - EXECUTION

3.1 ERECTION

- A. Erect metal building system according to manufacturer's written instructions and erection drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing in locations and to elevations indicated and according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Baseplates and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces before setting baseplates and bearing plates. Clean bottom surface of baseplates and bearing plates.
 - 1. Set baseplates and bearing plates for structural members on wedges, shims, or setting nuts.
 - 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of baseplate or bearing plate before packing with grout.
 - 3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
- E. Align and adjust framing members before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Make adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.

- F. Primary Framing and End Walls: Erect framing true to line, level, plumb, rigid, and secure. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist cure grout for not less than seven days after placement.
 - 1. Make field connections using high-strength bolts. Tighten bolts by turn-of-the-nut method.
- G. Secondary Framing: Erect framing true to line, level, plumb, rigid, and secure. Fasten secondary framing to primary framing using clips with field connections using non-high-strength bolts. Hold rigidly to a straight line by sag rods.
 - 1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
 - 2. Locate and space wall girts to suit door and window arrangements and heights.
 - 3. Locate canopy framing as indicated.
 - 4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
- H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
 - 1. Tighten rod and cable bracing to avoid sag.
 - 2. Locate interior end bay bracing only where indicated.
- I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to building structural frame.
- J. Structural-Steel Erection Tolerances: Comply with erection tolerance limits in AISC S303, "Code of Standard Practice for Steel Buildings and Bridges."

3.2 ROOF PANEL INSTALLATION

- A. General: Provide roof panels of full length from eave to ridge when possible. Install panels perpendicular to purlins. Use of through panel fastening for field panel splices shall be in complete accordance with the roof system manufacturers recommendations. Provide manufacturers standard details for concealed fasteners, cleats, etc. for attachment of miscellaneous trim and metal panel accessories.
 - 1. Rigidly fasten eave end of roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels.
 - 2. Provide weatherseal under ridge cap.
 - 3. Flash and seal roof panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 - 4. Use aluminum or stainless-steel fasteners for exterior applications and galvanized fasteners for interior applications.
 - 5. Fabricate panels in longest lengths possible, including requiring on-site field fabrication as required to minimize field panel splices.
- B. Standing-Seam Roof Panels: Fasten roof panels to purlins with concealed clips at each standing-seam joint. Install clips over top of insulation at location and spacing determined by manufacturer.
 - 1. Install clips to supports with self-drilling fasteners.
 - 2. Crimp standing seams with manufacturer-approved motorized seamer tool so clip, panel, and factory-applied side-lap sealant are completely engaged.

3.3 WALL PANEL INSTALLATION

- A. General: Provide panels full height of building when possible. Install panels perpendicular to girts.
 - 1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Install panels with vertical edges plumb. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
 - 2. Unless otherwise indicated, begin panel installation at corners with center of rib lined up with line of framing.
 - 3. Align bottom of wall panels and fasten with blind rivets, bolts, or self-tapping screws.
 - 4. Fasten flashing and trim around openings and similar elements with self-tapping screws.
 - 5. When 2 rows of panels are required, lap panels **4 inches** minimum. Locate panel splices over structural supports.
 - 6. When building height requires two rows of panels at gable ends, align lap of gable panels over wall panels at eave height.
 - 7. Provide weather-resistant escutcheons for pipe and conduit penetrating exterior walls.
 - 8. Flash and seal wall panels with weather closures under eaves and rakes, along lower panel edges, and at perimeter of all openings.
 - 9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as necessary for waterproofing. Handle and apply sealant and backup according to sealant manufacturer's written instructions.
 - 10. Use aluminum or stainless-steel fasteners for exterior applications and galvanized fasteners for interior applications.
- B. Uninsulated Panels: Install wall panels on exterior side of girts. Attach panels to supports with fasteners as recommended by manufacturer.

3.4 INSULATION INSTALLATION

- A. General: Install insulation concurrently with panel installation, according to manufacturer's written instructions.
 - 1. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
 - 2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- B. Blanket Insulation: Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths with both sets of facing tabs sealed to provide a complete vapor retarder. Comply with the following installation method:
 - 1. Over-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing members. Install layer of filler insulation over first layer to fill space formed by roof panel standoffs. Hold in place by panels fastened to standoffs.

3.5 DOOR INSTALLATION

- A. General: Seal perimeter of each door frame with elastomeric sealant used for panels.
- B. Personnel Doors and Frames: Install doors and frames straight, level, and plumb. Securely anchor frames to building structure. Set units with maximum **1/8-inch** clearance between door and frame at jambs and head and maximum **3/4-inch** clearance between door and floor.

- C. Glazing: Clean channel surfaces and prime as recommended by sealant manufacturer. Cut glass to required size for measured opening; provide adequate edge clearance and glass bite all around. Do not install glass that has significant edge damage or other defects.
- D. Door Installation Tolerances: Fit doors in frames within clearances specified in SDI 100.
 - 1. Fire-Rated Doors: Install with clearances specified in NFPA 80.
- E. Adjusting: After completing installation, lubricate, test, and adjust doors to operate easily, free from warp, twist, or distortion.

3.6 WINDOW INSTALLATION

- A. Set sill members and other members in a bed of sealant or with joint fillers or gaskets to provide weathertight construction. Refer to Division 7 Section "Joint Sealants" for compounds, fillers, and gaskets to be installed concurrently with window units.
- B. Anchor windows securely in place. Seal perimeter of each unit with elastomeric sealant used for panels. Mount screens direct to frames with tapped screw clips.
- C. Glazing: Replace glass that is broken or damaged to ensure that each piece of exterior glass is airtight and watertight through normal weather/temperature cycles and through normal window operation.
- D. Adjusting: Adjust operating ventilators and hardware to provide a tight fit at contact points and weather stripping, for smooth operation and a weathertight closure.

3.7 ACCESSORY INSTALLATION

- A. General: Install gutters, downspouts, and other accessories with positive anchorage to building and weathertight mounting. Coordinate installation with flashings and other components. The design wind speed and calculated wind uplift pressures for all accessories shall be in accordance with ASCE 7-98 and current building codes.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide 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 weather resistant.
 - 1. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum allowed by SMACNA with no joints allowed within 24 inches of corner or intersection.
 - 2. Separations: Separate metal from incompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
- C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Provide gutter bracket and spacer system spaced 36 inches on center staggered and in accordance with Figure 1-19A of the SMACNA Architectural Sheet Metal Manual. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed in accordance with Figure 1-35C of the SMACNA Architectural Sheet Metal Manual to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
 - 1. Provide elbow at base of downspout to direct water away from building.

- E. Pipe Flashing: Form flashing around pipe penetration and roof panels. Fasten and seal to roof panel as recommended by manufacturer.

3.8 FIELD QUALITY CONTROL

- A. Contractor will retain authorized agent of building manufacturer. A minimum of three (3) inspections will be made with written reports forwarded to the Architect.

3.9 CLEANING AND PROTECTION

- A. Touchup Painting: Immediately after erection, clean, prepare, and prime or re-prime welds, bolted connections, and abraded surfaces of prime-painted primary and secondary framing, accessories, and bearing plates.
 - 1. Apply compatible primer of same type as shop primer used on adjacent surfaces.
- B. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- C. Roof and Wall Panels: 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.
 - 1. Replace panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 13125

SECTION 15000 - GENERAL PROVISIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The General Conditions, Special Conditions and Supplemental Conditions of the specifications are binding on this section of the work.
- B. The drawings and specifications are complementary to each other and what is called for by either shall be as binding as if called for by both.
- C. This contractor shall provide qualified supervision, skilled labor, quality material, machinery, plant, and any other items necessary to install a complete, safe, and quietly operating mechanical system.
All required contractor certifications shall be submitted at the Owner's first Contract Requirements Meeting. This includes, but is not limited to, all factory authorized training.
- D. Prior to bid, this contractor shall examine all sections of the specifications and the complete set of contract drawings and bring to the attention of the Architect any omission or conflicts effecting this division of the work.
- E. Prior to final inspection, the Contractor shall complete all training required under this division; shall submit all prior inspection reports with the General Contractors signature indicating all items have been completed/corrected; the Test and Balance report shall be submitted to the Architect and reviewed by the Engineer.

1.2 CODES, STANDARDS, PERMITS, FEES, APPLICABLE STANDARDS

- A. The Contractor shall comply with the latest edition of the regulations of the National Electrical Code, the NFPA 13, 14, 20, 24, 90a, 90b, the International Building Code, the International Plumbing Code, the International Fuel Gas Code, the International Mechanical Code in the performance of his work wherever these regulations may apply.
- B. The work under this Division shall meet the minimum requirements of ASHRAE 90.1-2004 and/or the minimum equipment types and efficiencies as stated in the specifications or shown on the plans. The Contractor shall be responsible to correct any deficiencies, discrepancies or quality of work issues as determined by the Architect/Commissioning Authority/Engineer/Owner arising during the construction phase, test and balance phase, commissioning phase or warranty period of the project as required to meet or maintain the systems operation / integrity / quality at no additional cost to the Owner.
- C. The Contractor shall comply with ASHRAE Guides and all local codes, municipal, state, and Federal laws that apply to this construction project.
- D. The Contractor shall give all required notices, obtain all required permits, pay all required fees, and comply with local inspection requirements. Deliver to the Architect permits, licenses, certificates of test. Certificates from local and state health departments approving complete water and sanitary systems where applicable, and certificates from local fire department or state deputy fire marshal approving the fire protection system and equipment.
- E. Compliance: When materials or equipment must conform to the standards of organizations such as the American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electric Manufacturers Association (NEMA), and Underwriters Laboratories (UL),

proof of such conformance shall be submitted to the Engineer for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified in the individual sections.

- F. Construction Standards and/or Codes: The latest editions of standards and/or codes referenced, with all amendments as of the date of the opening of bids, shall govern the installation of all work and are adopted and incorporated into the contract documents and made a part thereof by reference, provided, however, that the drawings and specifications shall be adhered to in all cases where they call for quality of materials, quality of workmanship, or quality required by such standards and/or codes, and provided also that there may be no variances from the plans and specifications except to the extent that the said variance shall be necessary in order to comply with such standards and/or codes. It shall be the responsibility of the Contractor to familiarize himself with the requirements of such standards and/or codes. If there are any express requirements in the plans or specifications which are at variance therewith, all changes in the work necessary to eliminate the said requirements and make the work conform to standards and/or codes shall be accomplished in the manner provided in the contract for changes in the work.
- G. During construction and at completion of the work, the Contractor shall perform test(s) as called for in other sections of this specification. Perform any and all additional test(s) that the Owner/Architect/Engineer may consider to be necessary. Should it develop during testing that parts of the work are defective or does not comply with the specifications, such changes to the work as are necessary shall be made to put the work in condition to comply. Such work and required additional testing shall conform to the requirements of Section 00150, Instructions to Bidders (AIA Documents A701), Article 13 Miscellaneous Provisions, Paragraph 13.5 Tests and inspections.
- H. The following requirements are supplementary to the test specified for individual equipment and/or systems in this section of the specifications:
 - 1. Concealed or insulated work shall remain uncovered until required test(s) have been completed, but in the event that the project construction requires it, the Contractor shall arrange for test(s) on portions of the work as the project schedule progresses.
 - 2. The Architect and Owner shall be notified in writing prior to all tests and shall be represented at such test. Written notification shall be submitted no less than 72 hours prior to requested test times. No test shall be performed without the Architect/Owner's representatives present unless the Architect/Owner have stated in writing that they will not be in attendance. The cost of labor, material, instruments, etc. required for testing shall be borne by the Contractor, except where specified elsewhere.
 - 3. Acceptance test for operation and performance as specified and/or required for all equipment and systems shall be in the presence of the Architect, an Owners representative, as well as representatives of local authorities having jurisdiction.

1.3 DRAWINGS:

- A. Project drawings accompanying this specification are generally diagrammatic and do not show all details of bolts, nuts, connections, fittings, offsets, and the like required for the complete system and do not indicate the exact location of piping, fixtures, equipment, etc., unless dimensioned or noted. While these drawings shall be followed as closely as possible, all dimensions shall be checked at the building and any necessary changes shall be made in accord with structural and architectural conditions, the equipment to be installed, or with the work of other trades, without any additional cost to the Owner. The drawings and specifications are complimentary to the other and what is called for by one shall be as binding as if called for by both. Any component item under this contract shall be furnished and installed by the Contractor without extra charge.

1.4 EXAMINATION OF CONDITIONS:

- A. The contractor agrees, by submitting his bid, that he is satisfied by his careful examination as to the nature and location of the work; the condition of the ground; the character, quality, and quantity of the materials to be encountered; the general and local conditions; and all other matters which can affect the work under this contract.

1.5 COORDINATION:

- A. Mechanical, Plumbing, Fire Protection and Electrical Contractors shall coordinate work with all trades to avoid interference and establish necessary space requirements and tie-ins for each trade. The Mechanical Contractor, in a coordinated effort with all trades, shall submit coordinated drawings of the plans including below grade installations. The drawings shall be "printed" with backgrounds (architectural) features in a "light" line-weight with building systems (duct, piping, conduit, etc.) shown in a "heavy" line-weight; to scale, minimum $\frac{1}{4}" = 1'-0"$; and shall include the following detail:
 - 1. Ductwork size (including liner and/or insulation)
 - 2. Bottom and top of ductwork elevations
 - 3. Centerline of piping elevations
 - 4. Structural member type, size, and bottom/top elevations
 - 5. Dimensions indicating locations of ductwork, equipment, piping, etc. (in relation to column lines or building exterior).
 - 6. Hanger/support type, size, and locations
 - 7. Centerline of conduit elevations
 - 8. Equipment with tag, shown actual size, dimensioned, with accessories, elevations
 - 9. Recessed light fixtures
 - 10. Cable tray
- B. When trades are coordinating in above ceiling or attic spaces, priority shall be given to trades as follows:
 - 1. Sloped piping (waste piping, roof drain leaders, etc.)
 - 2. Fire sprinkler main headers
 - 3. Ductwork
 - 4. Piping 2-1/2" or larger
 - 5. Electrical conduit 2" or larger
 - 6. Cable Tray
 - 7. Branch piping
 - 8. Electrical conduit 1-1/2" or smaller
- C. Prior to starting installation, furnish to the General Contractor or Construction Manager, copies of approved shop drawings showing location of piping, equipment, etc. for review by the Architect.
- D. **The General Contractor shall schedule** a minimum of two (2) meetings per month with **all** trades prior to and during installation so as to avoid conflicts and assure that pipes, conduits, equipment, etc. are installed in the best manner, taking into consideration head-room, maintenance, service, replacement, and appearance. **The superintendent for the General Contractor along with the superintendents of the Mechanical, Electrical, Plumbing and Fire Protection Sub-contractors shall be in attendance at ALL coordination meetings. When the presence of the Controls Contractor is required, notice shall be given to the Architect in writing a minimum of one week in advance of the scheduled meeting.**

If Contractor desires, electronic files shall be made available through the Engineer's office upon receipt of a signed release form and a processing fee of \$75 per sheet.

1.6 TRAINING:

- A. All training required under this division shall be completed prior to final acceptance by the Owner.
- B. Training shall be considered complete when the Owner confirms adequate information to operate and maintain referenced system(s) has been conveyed.
- C. All training materials shall be submitted to the Architect for review by the Engineer. A copy of all training materials shall be placed into the final O & M documents.

1.7 RECORD DOCUMENTS:

- A. A set of working redline as-built plans shall be on the job site during working hours and shall be available for the Engineer/Architect/Owner to review upon request. Any variation to the Construction Documents outside of a ± 6 " tolerance shall be documented on the redlines. At the completion of the project, the documents shall be submitted to the owner along with the O & M Manuals.
- B. Upon project completion, all changes noted above shall be recorded neatly, with red ink, by the Contractor on an unused set of Contract Documents and submitted to the Architect. This project shall not be considered complete until the updated record documents have been received and reviewed by the Engineer. The reviewed Project Record Documents shall then be returned to the Architect and shall be submitted to the Owner along with the O & M Manuals.

1.8 PROJECT MANAGEMENT:

- A. Provide a designated project manager who will be responsible for the following:
 - 1. Construct and maintain project schedule.
 - 2. On-site coordination with all applicable trades and subcontractors.
 - 3. Authorized to accept and execute orders or instructions from Owner/Architect.
 - 4. Attend project meetings as necessary to avoid conflicts and delays.
 - 5. Make necessary field decisions relating to this scope of work.
 - 6. Coordination/Single point of contact.

END OF SECTION 15000

SECTION 15010 - MECHANICAL PROVISIONS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. The provisions of the Instruction to Bidders and of the Special Conditions, General Conditions, and Supplementary Conditions of this specification shall govern the work in this division. The attention of this Contractor is directed to the Supplementary Conditions concerning substitution of materials and equipment.

1.2 MATERIALS

- A. Material References: Equipment or materials are described by reference to manufacturer's published data, such data will be used as the basis for comparison with proposed substitute equipment or material. Such publications are available for review in the offices of the Engineers, and the Contractor is referred to them for full information.
- B. Use of Substitute Equipment or Materials: Manufacturer's seeking prior approval shall submit in accordance with the procedures as defined in the Instructions to Bidders, 3.3 Substitutions. The submittals shall include performance data, noise criteria, internal wiring diagrams, rough-in dimensions, space requirements, construction features and external wiring and piping connections. The submittals shall also include a line-by-line comparison of equipment/materials in the same format and language of referenced specification section. The mechanical, electrical, structural, architectural, space conditions and other features of the overall project design have been based on the requirements of the scheduled products. In addition to the equipment/material comparisons, the Contractor shall submit for approval a schedule setting forth in what respects the overall project design (mechanical, electrical, structural, architectural or space conditions) must be modified in order to permit proper installation and operation of the submitted products. Extensive or unreasonable modifications shall be considered cause for rejection of such products. In the event the substitute equipment/materials are approved, the Contractor shall bear all costs for requested changes related to the aforementioned systems and space conditions.
- C. Material List: Within thirty (30) days after award of the contract, the Contractor shall forward to the Engineer a complete list of all materials and equipment to be used in the work. The intent to use the exact material or equipment scheduled or specified does not eliminate the responsibility for submitting such a list. Should the Contractor fail to submit such a list, then the right is reserved for the Engineer to select a full line of material and equipment which shall be used in the work at no additional cost to the Owner.

1.3 GENERAL REQUIREMENTS

- A. Mechanical Drawings: The drawings specifically applicable to "Mechanical" are identified by the prefix "M" and "P". The Contractor shall refer to all other drawings for additional details such as ceiling heights, finishes, dimensions, building materials, door openings, and other architectural, structural, mechanical and electrical features which may affect "Mechanical".
- B. Interference: The mechanical drawings are generally diagrammatic and the Contractor shall provide offsets in the work so that interferences between piping, ducts, conduit, equipment, apparatus, architectural, and structural work will be avoided.

- C. Shop Drawings: Shop drawings required under "Mechanical" shall be included in a single submittal brochure including outline drawings, descriptive literature and/or specification data covering plumbing fixtures, major components of each mechanical system, insulation, and specialty items. Data shall show performance, internal wiring diagrams, roughing-in dimensions, space requirements, construction features and external wiring and piping connections. Where data includes information not applicable to this project, the information which is applicable shall be clearly identified for easy reference. A cover sheet shall be included, listing manufacturer and model number of each item submitted.
- D. Existing Utilities and/or Concealed Work: The locations, sizes, elevations, and other data indicated on the drawings relative to existing utilities and/or other work below the surface of the ground or in otherwise concealed locations are based on the information available during the design. Should actual conditions be at variance to conditions indicated by the drawings and specifications, all changes in work necessary to correct such variance and make the work conform to actual conditions shall be accomplished in accordance with applicable portions of the contract documents.
- E. Space Conditions:
1. All piping, ductwork, apparatus, equipment, and related work shall fit properly into the provided spaces in the building or property, and shall be introduced into the spaces at such time and in such manner as to not cause damage to the building structure or property.
 2. The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. This provision includes, but is not limited to, valves, traps, cleanouts, motors, controllers, drain points, etc.
- F. Excavation, Trenching, and Backfilling: All excavation, trenching, and backfilling necessary to receive any mechanical work shall be provided hereunder, and shall be performed in strict accordance with the applicable requirements of another division.
- G. Painting: Any required painting, except for the standard factory coat furnished on equipment, touch-up painting, and/or other painting as may be expressly required hereunder, will be provided under section entitled, "Painting"; however, the Contractor shall leave all mechanical work and equipment clean and free of any grease, dirt, rust, and other foreign matter and in suitable condition for proper painting.
- H. Access Doors: Access doors shall be furnished to provide access for service and maintenance of any concealed valves, cleanouts, air vents, or other equipment normally requiring servicing or maintenance, and for which other means of ready access is not built into the building or structure.
- I. Roof Flashing: Pipes, ducts, or other mechanical work passing through the roof shall be flashed and made water-tight in a manner approved by the manufacturer of the roofing material and complying with roof bond requirements.
- J. Equipment Supports and/or Foundations: Unless expressly stipulated otherwise, provide all supports, concrete foundations and/or pads required for proper installation of the equipment furnished under "Mechanical". Concrete work shall conform in all applicable detail to the requirements of "Concrete". Foundations requiring anchor bolts shall be constructed with such anchor bolts securely embedded in the concrete. Bolts shall have bottom plates and pipe sleeves unless otherwise detailed on the mechanical drawings.
- K. Controls, Switches, Starters, Etc.: Shall be identified with etched plastic or other permanent type nameplate as approved. Nameplate shall show function, system, etc.
- L. Operating and Maintenance Data and Instructions:

1. Prior to making request for final inspection, the Contractor shall put all mechanical systems and equipment into operation, and shall make all tests and adjustments. The Contractor shall furnish proper instructions to the Owner concerning operation and maintenance of all mechanical and related electrical equipment.
2. For all items of mechanical or related electric equipment or apparatus installed which requires operation of maintenance after occupancy, the Contractor shall furnish four (4) complete brochures and data as prepared and published by the manufacturer covering details of operation and maintenance. Brochures and data shall be delivered to the Engineer for transmittal to the Owner.
3. Each brochure shall contain one (1) copy of each "shop drawing". Shop drawings as originally submitted and approved shall be revised if necessary to reflect the work "as-built". Where brochures and data include information not applicable to this contract, the information which is applicable shall be clearly identified for easy reference.

1.4 ELECTRICAL APPARATUS AND WIRING

- A. Motors: Motors shall conform in all respect to the latest applicable standards of NEMA and IEEE and shall be the type most suitable for the equipment and/or machinery they are to operate. Each motor shall have sufficient capacity to start and operate the equipment and/or machinery it drives without its required brake horsepower exceeding the motor nameplate rating at the specified speed or at any speed and load which may be obtained by the drive actually furnished. Motor horsepowers scheduled on the drawings are estimated as a guide to approximate requirements; however, actual motors furnished shall be selected to comply with the requirements of this paragraph.
- B. Except as may be otherwise specified, each motor furnished hereunder shall be complete with a motor starter of proper type for the intended service. Motor starter shall comply with the requirements of NEMA and IEEE, and shall be equipped with proper thermal overload elements. Unless stipulated otherwise hereinafter and/or on the mechanical drawings, or required by the specific requirements of the motor and drive, starters shall comply with the following:
 1. Starters for motors 1/2 hp and larger and/or motors controlled by automatic devices shall be of the fully enclosed, general purpose surface mounting, full voltage, across-the-line, magnetically operated type.
 2. Where the motor is automatically controlled, the starter shall be provided with a three-position "Hand-Off-Automatic" switch mounted in the case.
 3. Where the motor is manually controlled from a remote location, a magnetic starter and flush mounted remote push-button station with pilot light shall be provided.
 4. Where the motor is manually controlled at the starter, a "Start-Stop" push-button shall be provided in the cover of magnetic starters.
 5. Where "reduced voltage" starters are indicated they shall be of the type specified hereinafter or indicated on the drawings.
- C. Installation:
 1. Unless expressly stipulated otherwise, electrical apparatus (motors, electric space heating equipment and/or other electrical equipment) furnished under "Mechanical" shall be installed under "Mechanical".
 2. All power wiring for electrical apparatus furnished under "Mechanical", including necessary circuit breakers or fused disconnect switches not furnished integral with the equipment, will be provided under "Mechanical". Coordinate final connection with Electrical.
 3. Starters, controllers and/or other control devices furnished under "Mechanical" for field installation in power wiring shall be installed under "Electrical".

4. All inter-control wiring, associated control system wiring and pilot circuit wiring required to accomplish any control sequence specified under "Mechanical" and/or shown on the mechanical drawings shall be provided under "Mechanical".
 - a. Associated control system wiring is defined as that wiring which is necessary to power or control any electrical-pneumatic or other electric control device furnished under "Mechanical".
 - b. Pilot circuit wiring is defined as that wiring which is necessary to power or control any starter and/or other controller furnished under "Mechanical" and interposed in the wiring to the electrical apparatus. For example, the wiring between a remote push-button station and a magnetic motor starter, including wiring through any safety or other auxiliary control devices interposed in such wiring, is considered pilot circuit wiring.
5. Any remote push-button stations and/or control devices provided under "Mechanical" and not interposed in the power wiring shall be installed under "Mechanical".
6. Conduit and outlet boxes for wiring provided under "Mechanical" will be provided under "Electrical" only when specifically indicated on the electrical drawings. Conduit and outlet boxes not so indicated on the electrical drawings shall be provided under "Mechanical".
7. Any wiring, conduit and outlet boxes provided under "Mechanical" shall be in strict accordance with all applicable requirements of "Electrical", provided however:
 - a. Line voltage and exposed wiring shall be run in conduit;
 - b. No splices will be allowed except at junction boxes and control centers;
 - c. No two wires of the same color shall be run in one conduit unless all wires of the same color are properly tagged at both ends and any splice points.

1.5 BELT DRIVES

- A. Each motor driven machine not directly connected to its driving motor shall be equipped with a V-belt drive of rating as recommended by the manufacturer for the service. For variable speed drives, the horsepower rating shall be based on the specified mid-position operating conditions.
- B. Variable and adjustable pitch sheaves shall, unless otherwise specified, be selected so that the required RPM will be obtained with the sheave set approximately in mid-position.
- C. Each belt drive shall be provided with an approved guard.

1.6 MISCELLANEOUS PROVISIONS

- A. Definition: Unless otherwise defined or modified on the drawings, the word "exposed" shall be interpreted to mean all piping, ducts, equipment, and similar work which is not concealed within the building walls, floors, or ceilings or above suspended ceilings or behind furring or buried in the ground.
- B. Certification: When the work of this Division 15 is completely balanced and in permanent operating condition, the Contractor shall submit certification in six (6) copies to the Engineer that the system is installed in accordance with drawings, specifications and manufacturer's recommendations and that safety and operating controls are functioning properly.

END OF SECTION 15010

SECTION 15015 - SEISMIC PROTECTION FOR MECHANICAL PIPING, DUCTWORK AND EQUIPMENT

PART 1 - GENERAL

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.1 GENERAL

- A. The Contractor shall install all mechanical equipment in accordance with the design detail provided by a seismic engineer. The Engineer shall be registered, shall be experienced in the design of site-specific seismic protection of mechanical equipment and piping and shall be employed by and responsible to the appropriate mechanical (HVAC or plumbing) sub-contractor.

END OF SECTION 15015

SECTION 15030 - START-UP OF MECHANICAL SYSTEMS

PART 1 - GENERAL

1.1 ADJUSTMENTS AND TESTS

- A. All piping systems for which specific tests have not been specified shall be tested hydrostatically and proved mechanically sound and free from leaks. Test pressure for such tests shall be 150% of the design working pressure of the line, but in no case less than 125 psig.
- B. Balance all water circulating systems so that quantities circulated will be as specified.
- C. Adjust and balance all duct systems so that air quantities at all inlets and outlets are as indicated and so that air distribution over entire cross sectional areas of conditioned spaces are draft free.
- D. Permanently mark all dampers and adjusting devices so that they can be restored if disturbed at any time.
- E. Adjust all equipment to perform as specified and as required to give satisfactory results.
- F. Upon completion of construction and testing, properly clean all cleanable type filters and leave in as new condition. Replace all throwaway filters with new, previously unpackaged filters.
- G. Contractor shall provide all instruments and facilities for performing all required tests in an approved manner.
- H. Comply with start-up requirements as stated in individual equipment specifications. This includes, but is not limited to, chillers, air handling units, packaged roof top units, fans, pumps, etc.

1.2 INSTRUCTIONS

- A. Provide and mount on the equipment or storage room wall a suitable #16 gauge metal cabinet with hinged cover and push button latch. Cabinet shall be designed for permanent storage of one (1) complete set of all required installation, operating and maintenance instructions which shall be enclosed therein by the Contractor. Cabinet shall be finished with a hammered gray baked-on enamel.

END OF SECTION 15030

SECTION 15035 - VIBRATION AND NOISE CONTROL

PART 1 - GENERAL

1.1 SCOPE

- A. Unless otherwise specified or noted on drawings, all mechanical equipment shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform deflection. Deflections shall be as noted on drawings or as specified hereinafter.

1.2 MANUFACTURER

- A. Vibration and noise control equipment specified hereinafter shall be as manufactured by Mason Industries, Inc. Equal products of Korfund, Peabody or Vibration Mountings & Controls will be acceptable.

PART 2 - PRODUCTS

2.1 VIBRATION MOUNTINGS

- A. Type A: Double deflection neoprene mountings shall have a minimum static deflection of 0.35". All metal surfaces shall be neoprene covered to avoid corrosion and have friction pads both top and bottom so they need not be bolted to the floor. Bolt holes shall be provided for these areas where bolting is required. On equipment such as small vent sets and close coupled pumps, steel rails shall be used above the mountings to compensate for the overhang. Mountings shall be Type ND or rails Type DNR as manufactured by Mason Industries, Inc.
- B. Type B: Spring type isolators shall be free-standing and laterally stable without any housing and complete with 1/4" neoprene acoustical friction pads between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8" of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflections, compressed spring height and solid spring height. Mountings shall be Type SLF as manufactured by Mason Industries, Inc.
- C. Type C: Equipment with operating weight different from the installed weight, such as chillers, boilers, etc., and equipment exposed to the wind, such as cooling towers, shall be mounted on spring mountings as described for Type B, but a housing shall be used that includes vertical limit stops to prevent spring extension when weight is removed. The housing shall serve as blocking during erection, and cooling tower mounts shall be located between the supporting steel and roof or the grillage and dunnage as shown on the drawings. The installed and operating heights shall be the same. A minimum clearance of 1/2" shall be maintained around restraining bolts and between the housing and spring so as not to interfere with the spring action. Limit stops shall be out of contact during normal operations. Mountings used out-of-doors shall be hot dipped galvanized. Mountings shall be Type SLR as manufactured by Mason Industries, Inc.

2.2 VIBRATION HANGERS

- A. Type D: Vibration hangers shall contain a steel spring and 0.3" deflection neoprene element in series. The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30 degree arc before contacting the hole and short circuiting the spring. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include a scale drawing of the hanger showing the 30 degree capability. Hangers shall be Type 30N as manufactured by Mason Industries, Inc.
- B. Type E: Vibration hangers shall be as described for Type D, but they shall be precompressed to the rated deflection so as to keep the piping or equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale. Submittals shall include a scale drawing of the hanger showing the 30 degree capability. Hangers shall be Type PC30N as manufactured by Mason Industries, Inc.,.
- C. Type F: Vibration hangers shall contain a steel spring located in a neoprene cup manufactured with a grommet to prevent short circuiting of the hanger rod. The cup shall contain a steel washer designed to properly distribute the load on the neoprene and prevent its extrusion. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 20 degree arc before contacting the hole and short circuiting the spring. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Hangers shall be provided with an eye bolt on the spring end and provision to attach the housing to the flat iron duct straps. Submittals shall include a scale drawing of the hanger showing the 30 degree capability. Hangers shall be Type W30 as manufactured by Mason Industries, Inc.

2.3 HORIZONTAL THRUST RESTRAINTS

- A. Type X: Where indicated, handling equipment shall be protected against excessive displacement which might result from high air thrusts in relation to the equipment weight. The horizontal thrust restraint shall consist of a spring element in series with a neoprene pad as described in Specification B with the same deflection as specified for the mountings or hangers. The spring element shall be contained within a steel frame and designed so it can be preset for thrust at the factory and adjusted in the field to allow for a maximum of 1/4" movement at start and stop. The assembly shall be furnished with one rod and angle bracket for attachment to both the equipment and ductwork or the equipment and the structure. Horizontal restraints shall be attached at the centerline of thrust and symmetrically on either side of the unit. Horizontal thrust restraints shall be Type WB as manufactured by Mason Industries, Inc.

2.4 BASES

- A. Type G: Vibration isolator manufacturer shall furnish integral structural steel bases. Bases shall be rectangular in shape for all equipment other than centrifugal refrigeration machines and pump bases which may be 'T' or 'L' shaped. Pump bases for split case pumps shall include supports for suction and discharge base ells. All perimeter members shall be beams with a minimum depth equal to 1/10th of the longest dimension of the base. Beam depth need not exceed 14" provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1". Bases shall be Type WF as manufactured by Mason Industries, Inc.

- B. Type H: Vibration isolator manufacturer shall provide steel members welded to height-saving brackets to cradle machines having legs or bases that do not require a complete supplementary base. Members shall be sufficiently rigid to prevent strains in the equipment. Inverted saddles shall be Type ICS as manufactured by Mason Industries, Inc.
- C. Type J: Vibration isolator manufacturer shall furnish rectangular structural beam or channel concrete forms for floating foundations. Bases for split case pumps shall be large enough to provide support for suction and discharge base ells. The base depth need not exceed 12" unless specifically recommended by the base manufacturer for mass or rigidity. In general, bases shall be a minimum of 1/12th of the longest dimension of the base, but not less than 6". Forms shall include minimum concrete reinforcement consisting of 1/2" bars or angles welded in place on 6" centers running both ways in a layer 1-1/2" above the bottom, or additional steel as is required by the structural conditions. Forms shall be furnished with steel members to hold anchor-bolt sleeves when the anchor bolts fall in concrete locations. Height saving brackets shall be employed in all mounting locations to maintain a 1" clearance below the base. Bases shall be Type K as manufactured by Mason Industries, Inc.

2.5 CURB-MOUNTED BASES

- A. Type Y: Where indicated, curb-mounted rooftop equipment shall be mounted on vibration isolation bases that fit over the roof curb and under the isolated equipment. The extruded aluminum top member shall overlap the bottom member to provide water runoff independent of the seal. The aluminum members shall house cadmium plated springs having a 1" minimum deflection with 50% additional travel to solid. Spring diameters shall be no less than 0.8" of the spring height at rated load. Wind resistance shall be provided by means of resilient snubbers in the corners with a minimum clearance of 1/4" so as not to interfere with the spring action except in high winds. The weather seal shall consist of continuous closed cell sponge materials both above and below the base and a waterproof flexible ductlike EPDM connection joining the outside perimeter of the aluminum members. Foam or other contact seals are unacceptable at the spring cavity closure. Caulking shall be kept to a minimum. Submittals shall include spring deflections, spring diameters, compressed spring height and solid spring height as well as seal and wind resistance details. Curb-mounted bases shall be Type CMAB as manufactured by Mason Industries, Inc.
- B. Type Z:
 1. Where indicated, curb-mounted rooftop equipment shall be mounted on vibration isolation bases that fit over the roof curb and under the isolated equipment. The extruded aluminum top and bottom members shall contain cadmium plated springs having a 1" minimum deflection with 50% additional travel to solid. Spring diameters shall be no less than 0.8" of the spring height at rated load. Springs shall be located at maximum intervals of 2' and shall be so selected that the total force of all the springs in the base system amounts to no more than 20% of the total weight of the mounted unit. Wind resistance shall be provided by means of resilient snubbers in the corners with a minimum clearance of 1/4" so as not to interfere with the spring action except in high winds.
 2. The weather seal shall consist of continuous closed cell sponge materials both above and below the base and a waterproof flexible ductlike neoprene connection joining the outside perimeter of the aluminum members. Foam or other contact seals are unacceptable at the spring cavity closure.
 3. Eighty percent (80%) of the weight of the equipment shall be taken by four (4) springs having a minimum deflection of 3-1/2" that are seated on steel bridging members that pass over the top of the unit. These springs shall be used in series with neoprene pads and shall have all the characteristics of the springs described above except that they shall be hot-dipped galvanized rather than cadmium plated. Attachment to the unit shall be by means of 1" threaded rods attached to the unit's lifting lugs by means of clevises. The cross members shall be supported by four (4) columns, which in turn are resting on load distributing beams that run the

length of the roof curb on either side of the unit. The beams shall be cemented to continuous 1/4" thick waffle neoprene pads so as not to cut the roof membrane.

4. Submittals shall include all spring deflections, spring diameters, compressed spring height and solid spring height as well as seal and wind resistance details. The sealing curb shall be Type CMAB and the 3-1/2" deflection springs Type IM, all as manufactured by Mason Industries, Inc. The vibration vendor shall furnish the steel structure with calculations showing that the roof supported beams will reflect no more than 1/360th of the span if supported at the ends as simple members with similar maximum deflection limitations for the upper bridging members. All structural steel members shall be primed with red lead paint prior to shipment.

2.6 FLEXIBLE PIPE CONNECTIONS

A. Type K:

1. Flexible neoprene connectors shall be provided on equipment as indicated or specified. They shall be manufactured of multiple plies of nylon tire cord fabric and neoprene both molded and cured in hydraulic rubber presses. No steel wire or rings shall be used as pressure reinforcement. Straight connectors shall have two spheres. Connectors up to and including 1-1/2" diameter may have threaded ends. Connectors 2" and larger shall be manufactured with floating galvanized flanges recessed to lock the connector's raised face neoprene flanges. Hoses shall be installed on the equipment side of the shutoff valves.
2. Connectors shall be rated a minimum of 150 psi at 220°F. Flanged equipment shall be directly connected to neoprene elbows in the size range 2-1/2" through 12" if the piping makes a 90 degree turn at the equipment. All straight-through connections shall be made with twin-spheres properly pre-extended as recommended by the manufacturer to prevent additional elongation under pressure. 12" and larger sizes operating above 100 psi shall employ control cables with end fittings isolated by means of 1/2" thick bridge bearing neoprene washer bushings designed for a maximum of 100 psi.
3. Submittals shall include two test reports by independent consultants showing minimum reductions of 20 db in vibration accelerations and 10 db in sound pressure levels at typical blade passage frequencies.
4. Elbows shall be Mason-Flex Type MFNEC, straight connectors Mason-Flex Type MFTFU or MFTNC, and control cable assemblies Type ACC, all as manufactured by Mason Industries, Inc.

B. Type L: Flexible stainless steel hoses shall be provided where indicated or specified.

1. Hoses shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes shall have male nipples. Lengths shall be as tabulated:

<u>Flanged</u>		<u>Male Nipples</u>	
3 x 14	10 x 26	1/2 x 9	1-1/2 x 13
4 x 15	12 x 28	3/4 x 10	2 x 14
5 x 19	14 x 30	1 x 11	2-1/2 x 18
6 x 20	16 x 32	1-1/4 x 12	
8 x 22			

2. Hoses shall be installed on the equipment side of the shutoff valves horizontally and parallel to the equipment shafts wherever possible. Hoses shall be Type BSS as manufactured by Mason Industries, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All noise and vibration control equipment shall be installed in strict accordance with manufacturer's recommendations and instructions.

END OF SECTION 15035

SECTION 15100 - PIPE IDENTIFICATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The work includes all labor, materials, equipment, and plant required for complete installation of identification markers and flow arrows on the following pipe systems.

1.2 INSTALLATION

- A. Pipe identification markers and flow arrows shall be install on pipe work after all insulation is complete and prior to installation of ceiling grid. Work may be performed by the Contractor's own forces, the Insulation Sub-Contractor or other qualified specialty sub-contractor.

1.3 SYSTEMS

PIPING SYSTEM:	BACKGROUND COLOR:	MARKER COLOR:
Domestic Cold Water	Green	White
Domestic Hot Water Supply	Yellow	Black
Domestic Hot Water Return	Yellow	Black
Fire Sprinkler Piping	Red	White
Gas, Natural	Yellow	Black
Sanitary Sewer	Green	White
Sanitary Vents	Yellow	Black
Chilled Water Supply	Green	White
Chilled Water Return	Green	White
Hot Water Supply	Yellow	Black
Hot Water Return	Yellow	Black
Roof Drainage	Green	White
Compressed Air Piping	Yellow	Black

1.4 STANDARDS

- A. The contractor shall furnish all material in accordance with latest edition of OSHA and ANSI Standard A13.1 applicable provisions.

PART 2 - EXECUTION

2.1 SHOP DRAWINGS

- A. Contractor shall furnish to the Architect shop drawings that show complete details of the marking system including colors and letter sizes.
- B. In accordance with ANSI A13.1 "Scheme for the Identification of Piping System", each marker shall show:
 - 1. Approved color coded background.
 - 2. Proper legend color in relation to background color.
 - 3. Approved legend height/size.
 - 4. Approved marker length.

- C. Direction of flow arrows shall be included unless otherwise specified.

2.2 MARKING SYSTEM

- A. All piping that is not built in or exposed in a finished space shall have identification markers and flow arrows installed. Mechanical Equipment rooms, Parking Garages, Stages, Gymnasiums, and other large assembly areas without ceilings shall not be considered finished spaces. Identification shall be required in these locations.
- B. Identification markers shall be semi-rigid plastic or vinyl; not pressure sensitive stick on markers. Pipe markers shall be as follows:
 - 1. Setmark Type SNA markers on pipe 3/4" thru 5", Snap On.
 - 2. Setmark Type STR markers on pipe 6" and larger, Snap On.
 - 3. Setmark outdoor grade plastic acrylic shall be used for identification system.
 - 4. Pipe identification as manufactured by Seton Nameplate Co., New Haven, CT. (1-800-243-66240); Brady Corporation, (1-800-537-8791), or prior approved equal.

2.3 LOCATIONS

- A. Locate pipe identification markers and flow arrows at each pipe penetration through a wall, floor, or ceiling construction.
- B. Locate pipe identification markers and flow arrows at each pipe penetration to underground.
- C. Locate pipe identification markers on all horizontal pipe runs at 25' intervals.
- D. Locate pipe identification markers at each piece of mechanical equipment, heater, pump, compressor, generator, etc. except on plumbing fixtures.

2.4 TAGS

- A. For pipe under 3/4", too small for color bands and legends, provide and install brass identification tags 1-1/2" in diameter with 3/8" black filled.
- B. Install tags at same locations as noted above. Attach with nylon snap ties and "S" hooks.

END OF SECTION 15100

SECTION 15120 - HANGERS AND SUPPORTS

PART 1 - NOT USED

PART 2 - PRODUCTS

2.1 MATERIALS AND SPECIALTIES

- A. Perforated strap, chains, and tie wire will not be permitted on the job.
- B. Pipe hangers, supports and accessories shall be the standard products of Grinnell Co, PHD Manufacturing, Michigan Hanger Co., a division of ERICO, B-Line Systems, Tolco, a Nibco company, or other prior approved manufacturer.
- C. For domestic hot, tempered, and cold water piping, roof or overflow piping, and condensate drain lines from air handling equipment where run above ground, hangers shall be oversized galvanized clevis with integral factory installed insulation shield. Hangers shall be spaced not over 6' apart for 1-1/2" and smaller pipes and not over 8' apart for pipes 2" and larger. Insulation shall be continuous through the hangers. Hangers shall be equal to PHD model #455 or Michigan Hanger #403.
- D. For cast iron or other ferrous piping run above ground, hangers shall be galvanized clevis. Hangers shall be spaced not over 5' apart on cast iron and 8' apart on other steel piping. Locate hangers as close as possible to cast iron hubs or bands. Hangers shall be equal to Michigan Hanger Co. #401.
- E. For "plastic" drainage piping systems; PVC, CPVC, Polypropylene, PVDF, or other, run above ground, hangers shall be galvanized V clevis hangers with support trough in 10' lengths. Hangers shall be spaced at each end of support trough, less than 10' oc. Hangers shall be equal to PHD #450 V and trough shall be equal to #450 T.
- F. For "plastic" water or sprinkler piping systems, PVC and CPVC, run above grade, hangers shall be galvanized, hangers shall be spaced a maximum of 4' apart and be equal to Michigan Hanger Co. #401.
- G. For support of all other overhead horizontal pipes use "Auto-Grip" Symbol 19-400A Universal hanger rings, Grinnell Figure 104 or Figure 260 adjustable clevis ring (on piping 3-1/2" size and over).
- H. Inserts shall be Unistrut Sections or Grinnell Figures 279, 281 or 285 wrought steel with proper size nut.
- I. Beam clamps shall be Grinnell as follows: Figure 131 I-beam clamp, Figure 226 Universal channel clamp or Figure 267 Simplex top beam clamp. Figure 87 C-clamp with lock-nut and retaining clip may be used within its recommended maximum load rating.
- J. All hangers, supports, hanger rods and accessories shall be Zinc-plated and/or Hot-Dip Galvanized unless otherwise specified.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Generally, horizontal overhead runs of piping shall be hung with adjustable, wrought-iron or malleable-iron pipe hangers. Chain strap, perforated bar or wire hangers will not be permitted. Hanger rings shall be copper or copper plated when in contact with copper pipe.
- B. Trapeze hangers constructed of angle or channel iron sections may be used in lieu of individual hanger rings where multiple pipes run parallel at the same elevation and grade. Details must be submitted for approval.
- C. Pipe clips, straps and hooks may be used where approved for the service.
- D. The exterior wall of the building shall not be pierced by hanger and/or support bolts.
- E. Supplementary steel supports shall be provided for proper support of piping and/or equipment which cannot be supported directly from the building structure.
- F. Inserts and bolts for supporting piping and/or equipment shall be placed in concrete or masonry areas before concrete is poured and as masonry is built. Where multiple pipes run parallel, approved Unistrut Channel sections may be used in lieu of individual inserts. Inserts and/or unistrut sections shall not be used in pre-cast concrete or in concrete less than 3-1/2" in thickness.
- G. Beam clamps shall be used insofar as possible where piping and/or equipment is supported from building structural steel. Punching of building structural steel will not be permitted. Support brackets electric welded to the building steel will be considered in lieu of beam clamps. Details must receive prior approval of the Engineer.
- H. Supporting brackets and hangers in plastered, painted or tiled areas shall be installed before such areas are plastered, painted or tiled.
- I. Hanger rods penetrating finished ceilings shall be provided with the equivalent of Grinnell Figure 133 spring ceiling plates.
- J. Spacing of piping hangers and/or supports shall conform to the following unless otherwise specified, detailed or approved:
 - 1. Steel pipe: 10'-0" maximum.
 - 2. Hard drawn copper pipe: 1-1/2" and smaller - 6'-0" maximum; 2" and up - 8'-0" maximum.
 - 3. Soft copper tubing: 5'-0" maximum.
 - 4. PVC or other "plastic" pipe: 4'-0" maximum
 - 5. Cast iron pipe: at or near each hub or band; 5'-0" maximum.
 - 6. Underground cast iron and tile: body of pipe firmly bedded on solid ground.
 - 7. Soil, waste, drain, and vent stacks: permanent support at base. Provide "riser" clamps at each floor, and at 10' intervals if floor height exceeds 14'.
 - 8. Generally: Provide additional hangers where a number of valves, fittings, etc., are assembled and at least one hanger not more than 2' from where a change in direction takes place in any pipe line.

END OF SECTION 15120

SECTION 15161 - L.P. GAS PIPING SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment, fuel and supplies and shall perform all work required for the L. P. gas piping system as shown on the drawings and as specified herein unless otherwise definitely excluded.
- B. All work shall conform to the latest edition of NFPA 54 and NFPA 58, International Fuel Gas code, and local gas code requirements.

1.2 DESCRIPTION OF SYSTEM

- A. This Section describes materials, equipment, workmanship and general requirements for the gas piping system as shown on the drawings and/or herein specified including the following:
 - 1. Exterior underground piping by local vendor
 - 2. Aboveground L.P. gas storage tank, control valve, and regulator reducing valves by local vendor.
 - 3. Interior piping, valves, and specialties above slab, see detail on plans.

PART 2 - PRODUCTS

2.1 GAS PIPING

- A. Gas piping shall be seamless ASTM A53 Grade "B" for pipe 2" and larger, and Grade "A" for 1-1/2" and smaller. All joints in buried, concealed, or inaccessible, or 3" and larger shall be welded. Welded fittings shall be standard black steel.
- B. Gas piping above slab 2-1/2" and smaller shall be of Schedule 40 seamless black steel pipe with screwed joints. Screwed fittings shall be standard black malleable iron.
- C. Gas piping under finished floor slab shall be Schedule 40 seamless black steel pipe within a conduit of Schedule 40 Galvanized steel pipe and fittings with screwed joints. Conduit shall be connected together and sealed gas tight. Vent to the outside using pipe vents at exterior face of building, see details on plan. Conduit shall be sized to allow removal of all under slab pipe with the last elbow in place. No gas piping shall be installed in such a manner that it cannot be removed for replacement. Entire conduit shall be coated with two (2) coats of rust resisting paint.
- D. Exterior gas piping underground shall be specially made steel pipe coated with plastic or vinyl. Pipe and fittings shall be welded. Wrap joints and fittings with primer and rubber tape. Holiday test all underground pipe before installation in trench for voids in the protective coating. Repair all voids or cuts prior to backfill.
- E. Gas piping shall be coated with two (2) coats of rust resisting yellow paint unless otherwise directed by Architect. Coordinate with Architect prior to painting. See specification Section 15100 for Pipe Identification.

2.2 VALVES

- A. Gas cocks 1/2" to 2" size, threaded bronze ball valve, Nibco Figure T-580.

- B. Plug valves shall be bronze body and plug, threaded ends, and square head for 125 pound W.O.G.. Valves shall be Crane No.250 Or Walworth No. 554.
- C. Lubricated plug valves shall be factory lubricated and sealed and shall be rated for L.P. gas.
- D. Ball valves shall be bronze body, brass stem, chrome plated brass ball and reinforced teflon seat, threaded ends, and rated 600 pound W.O.G.. Valves shall be Apollo 70-100
- E. Main gas service shall have valves at the service entrance and shall be visible, labeled, and not more than 5 feet above floor/grade.

2.3 MISCELLANEOUS MATERIALS

- A. Unions: shall be malleable iron with brass seats and face, with threaded ends.
- B. Flex Hose: Stainless steel braided hose rated for L.P. Gas service with threaded ends. Provide where specified on contract drawings.

2.4 PIPE SUPPORTS

- A. Perforated strap hangers, chain or wire will not be permitted on the job.
- B. Pipe hangers shall be furnished and installed per Specification Section 15120.
- C. Furnish and install intermediate or supplementary steel required for proper support of piping and installation of hangers of adequate dimensions.

PART 3 - EXECUTION

3.1 TEST AND INSPECTIONS

- A. Examine all pipe for defects before hanging. No defective or damaged pipe shall be permitted.
- B. After the installation of piping and prior to connection with the building system, test and inspect all system components, including pipe joints, in accordance with requirements of local authorities and this specification. Submit copy of test report to Architect and Engineer.
- C. Test the entire system of gas and service lines included in the contract with air under a pressure of 125 pounds per square inch gauge in all lines for two (2) hours. Leak test completed system after installation of all valves, fittings, hoses, trim, etc. are in place and prior to any use by owner. Test shall be scheduled so Owner, Contractor, State Fire Marshal, Architect, and Engineer may have a representative present.
- D. Do not test any line with air after it has been connected to a gas filled main or tank.
- E. If the inspection of the completed system or any part thereof shows any pipe, joint, or any part of the system which is defective, remove and replace or repair the defective work.
- F. The tests may be made on the system as a whole or on sections of pressure lines that can be isolated by valves.
- G. Provide, install, and operate all test equipment and apparatus required for the complete testing and inspection of all piping.

- H. Provide ten foot ground rod at tank location. Bond gas line to ground rod with #6 bare copper wire. Route wire thru ½" EMT conduit.
- I. Coordinate installation of gas piping to gas fired equipment with the Mechanical Contractor.
- J. L.P. gas storage tank shall be furnished by local vendor,
- K. Plumbing contractor shall arrange for the filling of tank prior to testing. Coordinate with Owner for vendor required for fuel. Cost of fuel to be paid by Owner.

END OF SECTION 15161

SECTION 15200 - THERMAL AND/OR ACOUSTICAL INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Attention is directed to Sections 15210 and 15220.
- B. The work of this Section consists of insulation of all hot and cold surfaces subject to heat loss, heat gain or condensation.

PART 2 - MATERIALS

2.1 MANUFACTURER

- A. Products of CertainTeed, Owens-Corning or Johns-Manville specified hereinafter are acceptable.

2.2 FIRE AND SMOKE HAZARD RATINGS

- A. All insulation, unless specifically excepted hereinafter, shall have composite (insulation, jacket or facing, and adhesive used to adhere the facing of jacket to the insulation) fire and smoke hazard ratings as tested by procedure in UL 723 and ASTM E-84, not exceeding:

Flame Spread	25
Smoke Developed	50
Fuel Contribution	50

- B. Accessories, such as adhesives, mastics, cements and tapes for fittings shall have the same component ratings as listed above.
- C. All products or their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed above requirements.
- D. Any treatment of jackets or facings to impart flame-and-smoke safety shall be permanent. Use of water-soluble treatments is prohibited.
- E. The Contractor shall certify in writing, prior to installation, that all products to be used will meet the above criteria.

PART 3 - EXECUTION

3.1 APPLICATION - GENERAL

- A. Execution of the work shall be by the insulation manufacturer or contractors specializing in the installation of insulation. The installing contractor shall submit their qualifications and certifications with the insulation submittals for the Engineer to review.
- B. Insulation shall not be applied until equipment, piping, and ducts have been inspected and released for application.
- C. Insulation shall be applied on clean, dry surfaces.

- D. All insulation shall be continuous through wall and ceiling openings and sleeves.
- E. Insulation on all cold surfaces where vapor barrier jackets are used shall be applied with a continuous unbroken vapor seal. Hangers, supports, anchors, or other items that are secured directly to cold surfaces shall be insulated and vapor-sealed to prevent condensation.
- F. Any insulation that becomes wet shall be removed, disposed, and replaced.
- G. Insulation shall be stored on the job site in a manner as to protect it from dust, debris, damage, etc.

END OF SECTION 15200

SECTION 15210 – PLUMBING PIPING INSULATION

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Work included in this section shall be the insulation of domestic hot, cold, tempered, and return piping above grade that has been tested and cleaned.
- B. Work included in this section shall be the insulation of roof and overflow drains and piping above grade that has been tested.
- C. Insulation shall be installed by factory authorized and trained personnel of a specialty sub contractor.

PART 2 – PRODUCTS

2.1 HAZARD CLASSIFICATION

- A. Fire hazard classification for all material shall not exceed flame spread of 25 and smoke development of 50, as listed by UL and acceptable under NFPA standards. This is to apply to the complete system and to the composite insulation with jacket or facings, vapor barrier, joint sealing tapes, mastic and fittings.

2.2 PIPE INSULATION

- A. Material for above grade piping shall be heavy density molded fiberglass with a factory applied all-service jacket composed of an outer layer of fiberglass scrim cloth, aluminum foil, and white kraft paper. Do not install fiberglass in any location that is not protected from the weather or is subject to getting wet. Material shall be Certain-Teed 500 Snap-On ASJ/SSL pipe insulation.
- B. Material for below grade hot tempered, and return water lines and fittings shall be 1-1/2" thick Pittsburgh Corning Foamglass. Finish coat with Foster 60-25 cut back asphalt. Reinforce with glass or nylon open weave cloth.
- C. Material for air condition condensate or above grade ice machine drains shall be Armstrong #AP Armaflex self-sealing 1/2" thick closed cell elastomeric insulation.

PART 3 – EXECUTION

3.1 PIPING

- A. All fiberglass pipe covering shall be furnished with self-seal lap and 3-inch wide butt joint strips. The release paper is pulled from adhesive edge, pipe covering closed tightly around pipe and self-seal lap rubbed hard in place with the blunt edge of an insulation knife. This procedure applies to longitudinal as well as circumferential joints. Care shall be taken to keep jacket clean, as it is the finish on all exposed work. All adjoining insulation sections shall be firmly butted together before joint strip is applied, and all cold water service lines shall have vapor seal mastic thoroughly coated to pipe at butt joints and at all fittings. All fittings, valve boxes, unions, and flanges shall be finished as follows:

1. Apply molded or segmental insulation to fittings equal in thickness to the insulation on adjoining pipe and wire in place with 2 #14 copper wires or stainless steel bands.
 2. Apply a skim coat of insulating cement to the insulated fitting, if needed to produce a smooth surface. After cement is dry, apply Owens-Corning Fiberglas fitting mastic, Type C, UL labeled.
 3. Wrap the fitting with fiberglass reinforcing cloth overlapping the preceding layer by 1" to 2".
 4. Apply a second coat of mastic over cloth working it well into mesh of cloth and smooth the surface. Mastic to be applied at the rate of 40 square feet per gallon.
 5. The Contractor, at his option, may provide molded PVC fitting covers, secured with stainless steel tack fasteners, fiberglass blanket insulation with joints sealed with pressure sensitive tape.
 6. Manufacturer's written instructions shall be strictly adhered to for work in this section.
- B. Fiberglass insulation shall be as manufactured by Certain-Teed, Owens-Corning SSL 1, Knauf, or Micr-Lok by Mansville.
- C. Insulation for piping within cavities of block walls may be ½" thick Armstrong Armaflex, Rubatex, or Halstead.
- D. Foam plastic insulation is not acceptable.
- E. Insulation shall be installed continuous through hangers and sleeves in all types of walls. Do not "cut back" insulation at sleeve locations.

3.2 INSULATION REQUIREMENT:

A. <u>Service</u>	<u>Thickness</u>
Cold Water	1/2 inch with vapor barrier
Hot Water and Recirculating Water	1 inch with vapor barrier
Roof Drain Piping	1-inch for piping above ceiling ½"-inch for piping within walls or chase
Roof Drain Bodies	2" thick, 1 pcf duct wrap, seal to deck vapor tight

END OF SECTION 15210

SECTION 15220 - DUCT INSULATION

PART 1 - GENERAL

1.1 SCOPE

- A. This specification defines the materials and methods of the duct system insulation. Attention is directed to Section 15200 for General Insulation requirements.

1.3 DEFINITIONS

- A. "Concealed ductwork" is defined to be that portion of a duct system that is installed within ceiling spaces, building chases or in architecturally furred-in spaces.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Fiberglass duct insulation (duct wrap) shall be an R-8 (installed), flexible blanket type with factory applied vapor barrier. Vapor barrier shall be minimum 0.7 mil thick aluminum foil reinforced with fiberglass yarn mesh and laminated to 40-lb. chemically treated fire resistant Kraft (FRK).
- B. All insulation shall have a composite (insulation, jacket and adhesive used to adhere the jacket to the insulation) fire and smoke hazard rating, as tested by procedure in UL 723 and ASTM E 84, not exceeding:

Flame Spread	25
Smoke Developed	50
Fuel Contribution	50

- C. Accessories, such as adhesives, mastics, cements and tapes for seams, joints and fittings, shall have the same rating as listed herein.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All supply, return, outside air, and exhaust ductwork shall be insulated.
- B. Duct wrap shall be applied with edges tightly butted and secured with outward clinch staples, 2-inches on center. All joints and seams shall be sealed with glassfab and mastic. On ducts over 24" wide or high, insulation shall be applied over pins welded or cemented to the ducts with all joints sealed with glassfab and mastic. Standing duct braces and other duct projections shall be insulated.
- C. Insulation shall be applied on clean, dry surfaces after the ductwork has been inspected and released for insulation application.
- D. All insulation shall be continuous through wall and ceiling openings and sleeves.

- E. Insulation on all cold surfaces where vapor barrier jackets are used shall be applied with a continuous unbroken vapor seal. Hangers, supports, anchors, or other items that are secured directly to cold surfaces must be insulated and vapor sealed to prevent condensation.
- F. Insulation shall be protected from physical damage at points of support where the insulation must carry the load imposed by the support. Coordinate this requirement with the installation of hangers and supports.

END OF SECTION 15220

SECTION 15400 – PLUMBING - GENERAL

PART 1 – GENERAL

1.1 QUALITY ASSURANCE

- A. "General Conditions" and "Special Conditions" apply.
- B. Before construction of project starts, check locations and inverts of existing and proposed pipes, sewers and mains. Review other drawings for project; check grades, elevations, location of structural elements, locations and sizes of chases, type and methods of construction of floors, walls, partitions, etc. Report to Architect before start of construction any unsatisfactory condition or conflict between plumbing and other trades. No extra charge will be approved after start of construction for work resulting from failure to follow these instructions.
- C. Drawings do not indicate all offsets, fittings, and specialties. Examine other drawings, investigate conditions to be encountered and arrange work accordingly, furnishing additional fittings, valves, specialties, etc., without extra charge. Where conditions necessitate a rearrangement, submit for approval sketches showing a proposed arrangement.
- D. Upon completion remove trash and debris, clean and paint unplated metal work and clean fixtures. Remove excess excavated earth from site.
- E. Unless otherwise shown, piping to be installed concealed, straight without sags or pockets and graded for drainage. Cut pipe ends square and ream; before assembly clean off all dirt, scale and chips. Braze/Solder joints according to fittings manufacturer's recommendations. Apply pipe compound to external threads only. Run cold water pipe at least 12 inches away from any source of heat. Make adequate provisions for expansion and contraction of pipes. Protect all piping and equipment during construction. Cover all piping ends to prevent entrance of dirt and debris.
- F. Liability for damages to buildings, contents of buildings, or site property during construction and guarantee period resulting from workmanship, materials or equipment supplied under this specification is a part of this contract.
- G. The Contractor shall provide all materials and labor to install the plumbing system and shall comply with all local regulations, obtain all permits and pay for all fees. The work shall be in accordance with A.S.P.E. guidelines and conform with the International Plumbing Code and as required by the local plumbing authority.
- H. Cutting and Repairing: The work shall be carefully laid out in advance, and unnecessary cutting of construction shall be avoided. Damage to building, piping, wiring, or equipment as a result of cutting shall be repaired by mechanics skilled in the trade involved. Cutting of structural elements shall be approved by the structural engineer/Architect prior to cutting.
- I. Submittals for each piping system shall be separated into categories by specification section and for the piping materials and products that each system utilizes, ie. domestic water, waste, condensate, roof drainage, etc.
- J. All work shall be installed under the direct supervision of a licensed or journeyman plumber.

PART 2 – PRODUCTS

2.1 SANITARY WASTE, VENT, AND STORM DRAIN PIPING

- A. All pipe fittings shall be long radius fittings, except fittings in vent piping may be short radius.
- B. Prior to commencing work, check invert elevations at sewer connection points, confirm inverts and verify proper slope for drainage and proper cover to avoid freezing.

2.2 UNDERGROUND PIPE AND FITTINGS: May be one of the following materials:

- A. Not Used.
- B. Schedule 80 polyvinyl chloride (PVC), conforming to ASTM D1785, with solvent welded joints. Solvent cement conforming to ASTM D2564. "Push-on" type fittings with gaskets or Coextruded composite PVC (cellular core) piping are not acceptable. Polyvinyl Chloride (PVC): Schedule 80 PVC shall not be used where waste temperature may exceed 140°F, such as mechanical equipment rooms, commercial kitchens, and sterilizer areas.

2.3 ABOVEGROUND PIPE AND FITTINGS: May be one of the following materials:

- A. Service weight, Class SV, cast iron, conforming to ASTM A74 and CISPI 301 Piping shall bare the CISPI stamp. Cast iron joints shall be caulked and leaded or compression type joints using single piece, positive seal, elastomeric gasket conforming to ASTM C564.
- B. Service weight, Class SV, no-hub cast iron, conforming to CISPI 301, with neoprene gasket clamp and shield joining assembly conforming to CISPI 310. Coupling shall be 80-pound tork bands by Husky "White" SD2000, Mission heavy duty "Blue", Ideal heavy duty "Yellow", Mifab heavy duty "Orange", or equal.
- C. Copper tubing, DWV grade, hard temper, conforming to ASTM B306, solder joints with fittings conforming to ANSI B16.33 and ANSI B16.29.

2.4 WATER PIPE AND FITTINGS

- A. Underground:
 - 1. Water piping underground within the structure and to a point 5' outside shall be Type K copper conforming to ASTM B88 with silver brazed joints or Type K soft copper with no joints underground.
- B. Aboveground: Piping aboveground shall be of the following material:
 - 1. Domestic water piping 2" and larger shall be Copper tubing, hard-drawn, Type L, conforming to ASTM B88, with brazed or solder joint wrought copper fittings.
 - 2. Domestic water piping 1-1/2" and smaller may be Cross-linked polyethylene (PEXa) water distribution pipe as manufactured by "Rehau", shall be third-party certified to standards NSF 14/61, ASTM F 876, F-877, and CSA B 137.5. Pipe shall be certified by the IAPMO Plumbing Research Committee and shall be marked with the UPC Shield. All hot- and cold-water distribution pipe shall have a minimum pressure rating of 160 psi at 73.4°F, 100 psi at 180°F and 80 psi at 200°F. Piping shall be tested for resistance to hot chlorinated water in accordance with ASTM F 2023 and have a minimum extrapolated time-to-failure of 50 years, calculated in accordance with section 13.3 of F 2023. PEX pipe shall have a co-extruded UV Shield made from UV-resistant polyethylene providing UV resistance for up to one (1) year. Pipe to have a Flame Spread Index of less than 25, and a Smoke Developed Index of less than 50, when

tested in accordance with ASTM E 84. The minimum bend radius for cold bending of the pipe shall be not less than five (5) times the outside diameter.

Pipe shall carry the following markings every three (3) feet: Manufacturer's name or trademark, nominal size, PEXa (material designation), SDR9 (standard dimension ratio), ASTM F 876 / F 877 / F 2023 / F 2080, CSA B137.5, NSF-pw, UPC Shield, 160 psi @73.4°F / 100 psi @180°F / 80 psi @200°F, POTABLE TUBING and manufacturing date.

All fittings used with cross-linked polyethylene (PEXa) water distribution pipe shall be "Rehau" "EVERLOC" fittings of the cold-expansion compression-sleeve design. All polymer fittings shall be made from modified PPSU (black). All compression sleeves shall be made from PEXa crosslinked polyethylene. All fittings shall be third-party certified to applicable standards ASTM f877, NSF/ANSI 14, NSF/ANSI 61 and CSA B137.5. Where joints are encased in concrete or buried underground, joints shall be wrapped if required per the manufacturer's recommendation to protect the material. Comply with manufacturer's product data, including product technical bulletins, installation instructions and design drawings. Piping and fittings other than the PEX-a specified above shall be increased one pipe size larger than that shown on the contract documents due to restricted flow thru fitting(s).

3. Exposed piping in finished areas shall be chrome-plated brass pipe to the shutoff or stop valve of each fixture.

2.5 VALVES

- A. Bronze body valves incorporating either copper-zinc alloy exceeding 16 percent zinc content or aluminum alloy for trim material will not be permitted. All valves shall be bronze body with screw or solder ends. Stems shall be vertical unless structure dictates otherwise. All valves shall be of the same manufacturer. Valves shall be Nibco, Hammond, Stockham, Walworth, Crane, Milwaukee or approved equal. Nibco figure numbers indicated:

Check - 200 lb. W.O.G.	Fig. 413 S or T
Balance Valve - Hammond	Fig. 308
Ball Valve -Full Port	Fig. 585 S or T
Butterfly Valves	Fig. N200235

- B. Valve Stems: Shall be oriented for accessibility as approved by the OWNER's representative and Engineer. Do not install valves with stems in the downward direction.

- C. Installation:

1. Location of Valves: Provide an accessibly located valve where indicated or required for proper system, specialty and equipment operation and maintenance.
2. Valves shall be installed so no forces are transmitted to the valve through the piping supports.
3. Valves Required for Each Flow Path: Provide combination balancing and shut-off valve in all multi-zone circulating systems, and at all equipment where indicated for proportioning flow.
4. Ball Valves: Install ball valves for shut-off and isolating service, to isolate equipment, parts of systems or vertical risers.
5. Globe or Angle Valve: Install globe or angle valves for throttling service and control device or meter by-pass.
6. Ball Valves: Two and one-half (2-1/2) inches and smaller - Use for directional flow and quick-acting applications, interchangeably in place of gate and globe valves.
7. Butterfly Valves: Two and one-half (2-1/2) inches and larger - Use butterfly valves only as indicated on contract drawings. Use iron body, aluminum bronze disc, 416 stainless steel stem, EPDM seat, wafer design, lever operator to six (6) inch size, gear operated and crank for eight (8) inches and above.

- 8. Check Valves: Shall be spring loaded on discharge of pumps and water booster pumps.
- D. Cleaning: All valves and appurtenances shall be flushed clear of all foreign material after installation.
- E. Testing: Field test all valves and appurtenances for proper operation, proper adjustments and settings, freedom from vibration, binding, scrapings, and other defects. Check all valve supports for strength and high quality workmanship. All defects shall be corrected. Hydrostatic and leakage tests shall be performed as specified in this section.

2.6 MISCELLANEOUS MATERIALS

- A. Nipples: Nipples shall be the same material as the piping in which installed.
- B. Unions: Unions shall be brass or bronze, either threaded or with solder joint ends for use in copper tubing.
- C. Flanges: Flanges shall be steel, 150 pound, for ferrous piping, or wrought copper or bronze with red rubber gasket for copper piping.
- D. Gaskets: Gaskets shall be full face flat type made of synthetic rubber.
- E. Floor, Wall, and Ceiling Escutcheon Plates: Provide split hinged, locked type, or one-piece escutcheon plates of pressed steel with setscrew and heavy coating of copper, nickel, and chromium.
- F. Solder: SOLDER AND FLUX SHALL BE "LEAD FREE". "Lead Free" shall be defined as less than 0.2 percent lead in solder and flux and less than 8.0 percent in pipes and fittings. All solder joints in potable water piping shall be 95/5 tin/antimony.
- G. Exposed Water Piping:
 - 1. Where any water piping is exposed to outdoor air temperature, provide freeze protection. This shall apply but not be limited to the following piping systems.
 - a. Domestic cold water, tempered hot water, tempered hot water recirculating piping and P-traps.
 - 2. Freeze protection of piping shall be by means of automatic heat tape applied to pipe to prevent water temperature from dropping below 38EF when outside air temperature is 15EF.
 - 3. Heat tape shall be Chromalox Type TBT with integral thermostat set at 38EF. Heat tape shall dissipate 7 watts per lineal foot when supplied with 120V AC current. Heat tape shall be installed in strict accordance with manufacturer's written recommendations and instructions.

2.7 MISCELLANEOUS FITTINGS

- A. Floor Drains: Coated cast iron body drain with nickel-bronze grate, membrane clamping device, bottom outlet of size indicated with connection of type as required. Provide trap seal for floor drains. Drains shall be as scheduled on drawings by Zurn, Smith, Josam, or prior approved equal.
- B. Traps: Each fixture and piece of equipment requiring connections to the drainage system shall be equipped with a trap. Each trap shall be placed as near the fixture as possible and no fixture shall be double trapped. Provide deep seal cast iron traps on each floor drain.

- C. Wall Hydrants: Wall hydrants shall be automatic draining, vacuum breaker-backflow protected, frost-proof wall hydrant, 3/4" water supply connection and 3/4" male hose thread. Hydrants shall be Woodford, Zurn, Smith, Josam or prior approved equal. Provide one (1) loose key for each hydrant and give to Owner.
- D. Hose Bibs: Hose bibs shall be the vacuum breaker-backflow protected faucet. Provide 3/4-inch inlet connection and 3/4-inch male hose thread. Hose bibs shall be Woodford with Nidel vacuum breaker, Zurn, Smith, Josam or prior approved equal. Provide one (1) loose key for each hydrant and give to Owner.
- E. Thermometer: Provide 9-inch scale and 3-1/2-inch stem industrial adjustable angle thermometer. Provide separable socket to match stem on thermometer. Range shall be 30 degrees to 180 degrees F. Thermometer shall be as manufactured by Terice Company, Taylor, Marshalltown or Marsh.
- F. Dielectric Fittings: All sizes - dielectric union with galvanized or plated steel female pipe-threaded end and copper solder-joint end.
- G. Thermostatic Mixing Valves: Mixing valves, thermostatic type, shall be line size and finish as noted in the fixture schedule. Each valve shall be constructed to control the mixing of hot and cold water and to deliver water at a desired temperature regardless of pressure or input temperature changes. The control element shall be of an approved type. The body shall be of heavy cast bronze, and interior parts shall be brass, bronze, or copper. The valve shall be equipped with necessary stops, check valves, unions, ball valve, thermometer, and sediment strainers on the inlets. Mixing valves shall maintain water temperature within 5 degrees F of any setting.

2.8 SHOCK ARRESTERS

- A. Install pre-manufactured shock arresters at each hot and cold-water supply as recommended by manufacturer. Shock arresters shall be tested and rated in accordance with PDI-WH-201 and ASSE 1010. Off-set to avoid obstruction. Install water hammer arrestors complete with accessible isolation valve. Shock arresters shall be Zurn, Wade, Smith, or Josam.

2.9 PIPE SUPPORTS

- A. Perforated strap hangers, chain or wire will not be permitted on the job.
- B. See Specification Section 15120.

2.10 PIPE SLEEVES

- A. Pipe sleeves in exterior walls, below and above grade, footings, foundations or floor shall be zinc-coated steel pipe. Provide stress relieving arch for pipes passing through horizontal grade beams or footing and where required by structural conditions.
- B. Sleeves in firewalls shall be zinc-coated steel pipe.
- C. Sleeves in non-rated walls and partitions shall be not less than 20 gauge zinc-coated sheetmetal.
- D. Isolate copper piping from sleeve with the pipe insulation.

2.11 ACCESS DOORS AND PANELS

- A. Furnish to General Contractor factory fabricated doors and panels for installation at all places where specialties, valves, equipment, etc., are inaccessible. Access means to be of adequate size for intended service and of approved manufacture, finish and type. Instruct General Contractor where to install access means and check for proper location. Submit shop drawings.
- B. Access doors and panels shall be fire rated the same as the wall, ceiling or floor in which it is installed.
- C. Access doors shall be as manufactured by Karp, Josam, Acudor, Elmdor/Stoneman or approved equal.
- D. Access doors for ball valves shall be installed as to allow the valve handle to face the door opening when in the "off" position.

2.12 CLEANOUTS

- A. Cleanouts, including PVC piping system, shall be iron body ferrules with taper thread plugs of either brass or cast bronze, raised hexagonal heads for wall cleanouts and countersunk plugs with slots for floor cleanouts. Provide floor cleanout body and frame with round adjustable scoriated covers attached to the body or plug by machine screws. Cleanouts shall be full line size. Cleanouts shall be as manufactured by Zurn, Smith, Josam or approved equal. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Install with clearance at cleanout for rodding of drainage system.
- B. Cleanouts shall be as listed in schedule on plans.

2.13 FLASHING

- A. Where pipes pass through the roof, flash with 4-lb. lead enclosing pipe and extending 8" in all directions along roof. Turn down into vent a minimum of 2-inches and provide flashings to the roofing contractor for installation. Plumbing contractor shall turn down flashings into vent.

2.14 FIRESTOPPING

- A. All piping passing through walls, floor, ceiling and roof (fire-rated and non-rated) shall be sealed with a firestopping system conforming to UL 1479 and ASTM E 814.
- B. Firestopping system shall consist of 3M Company CP-25 caulk, 303 putty, FS-195 strips and CS-195 sheets.
- C. Firestopping shall be applied according to the manufacturer's written instructions.
- D. PVC piping shall not penetrate or be installed in fire-rated wall, floor or ceiling of the structure.

2.15 IDENTIFICATION OF VALVES AND PIPING, AND EQUIPMENT

- A. Valves and piping shall be identified by metal tags for valves and precoiled markers/ strap around/colored tape for piping as manufactured by Seaton Name Plate Company or approved equal. See Specification Section 15100.
- B. Valve tags shall be 1-1/2" diameter brass tags with black filled letters not less than 1/4" high. Tags shall be attached to valves with "S" hooks or brass jack chain.

- C. Each valve tag as described above shall have identifying letters designating the system on which it is installed.
- D. Pipe labels shall indicate fluid/gas in the pipe and direction of flow.
- E. Provide engraved rigid 3" x 1" Phenolic labels with 1/4" minimum white letters on black background fastened to each piece of equipment in multiple system projects. Equipment shall be defined as boilers, water heaters, mixing valves, etc.

2.16 CLEANING AND PAINTING

- A. The plumbing contractor shall "touch up" paint, to restore to original "new" appearance, all equipment installed under this contract in which the factory applied finish was damaged or scratched during construction and which is not otherwise to be painted by the General Contractor.
- B. All structural steel, rods, equipment stands, etc., installed by this contractor whether concealed or exposed shall be cleaned as follows: Uncoated Steel and Iron Surfaces: Remove scale by wire brushing, sandblasting, clean by washing with solvent. Apply treatment of phosphoric acid solution. Prime paint after repairs. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Clean surfaces with solvent. Prime bare steel surfaces. Surfaces inaccessible after placement shall be primed and painted prior to placement. Use "Rust-Oleum clean metal primer" or equal, rust preventative primer and paints suitable for damp atmosphere.

PART 3 – EXECUTION

3.1 ROCK EXCAVATION

- A. Remove any rock encountered in the excavation to a minimum dimension of twelve (12) inches outside the pipe.
- B. Blasting: permitted only where other excavation methods have been proven ineffective and only after all necessary permits and approvals are acquired.
- C. Rock excavation: Compute on the basis of the depth of rock removed and a trench width two (2) feet larger than the outside diameter of the pipe where one (1) pipe is laid in the trench and three (3) feet larger than the combined outside diameter where two (2) pipes are laid in the trench.
- D. The unit price for rock excavation includes the pit run sand and gravel or crushed stone backfill under the pipe.
- E. Include any rock excavation shown on the plans in the Base Bid.

3.2 INSTALLATION:

- A. Cleanouts, Clearance and Protection: Use blanked tees at 90 degree bends to provide cleanout capability. Locate cleanouts in floors a minimum of one (1-1/2) foot from walls and installed equipment in order to provide proper access. Provide ample space for piping and take particular care to avoid structural interference and conflicts between the several types of mechanical and electrical work. Fully enclose or properly guard belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts located so that any person may come in close proximity thereto.

- B. **Cleaning and Protection of Pipe, Fixtures, Materials, and Equipment:** Before being placed in position, carefully clean pipe and fittings. Maintain all pipe in a clean condition. Close pipe openings with caps or plugs during installation. Tightly cover fixtures and equipment and protect against dirt, water, and chemical or mechanical injury. Upon completion of all work, thoroughly clean, adjust, and operate the fixtures, materials and equipment. Pipe shall be protected during handling against impact shocks and free fall. Piping shall be cut accurately to measurements established at the site and shall be emplaced without springing, forcing, excessive cutting or weakening of the building structure.
- C. **Buried Piping:** Place sewer and water piping in separate trenches below the frostline. Buried piping shall extend from approximately 6 inches above the lower floor or inside the structure wall to a point not less than 5 feet outside the structure.
- D. **Bell and Spigot Cast Iron Soil Piping:** Lay non-pressure pipe with the bell ends in the upgrade direction. Adjust spigots in bells to give a uniform space all around. Blocking or wedging between bells and spigots is not permitted. Replace by one of proper dimensions any pipe or fitting that does not allow sufficient space for proper caulking or installation of joint material. Make joints with the rubber gaskets previously specified for joints with this piping, except that where it is impractical to install rubber gasket joints, use leaded joints. Install rubber gasket joints in accordance with the recommendations of the pipe manufacturer. Make leaded joints in the following manner: Pack braided or twisted white oakum or hemp rope into the annular space between bell and spigot to a depth that will provide a minimum depth of one inch for leading. Do not allow oakum to project into the bore of finished joints. After gaskets are placed, clean the joints and fill the remaining space with one pouring of molten lead. Caulk lead in a manner that will assure a tight joint without over straining the iron of the bell, and so that after caulking the lead will be practically flush with the base of the bell.
- E. **No-hub Cast Iron Pipe Joints:** Tighten band and screw assemblies and cast iron clamp assemblies used in conjunction with hubless type cast iron soil pipe to the manufacturer's recommended torque on each band screw with a torque wrench specifically designed for the purpose. Re-torque each screw after not less than 24 hours. All plugs, caps, tees, and bends deflecting 22-1/2 degrees or more shall be provided with a reaction backing or anchor regardless of pipe size.
- F. **Installation of Screw-Jointed Piping and Solder-Jointed Tubing:** Cut screw-jointed piping and solder-jointed tubing accurately to required measurements and work into place without springing or forcing. Make proper provision for the expansion and contraction of all pipe and tubing lines. Free pipe and fittings from fins and burrs. Make screw joints with a lubricant or polytetrafluoroethylene tape applied on the male threads only; full cut threads and not more than three threads on the pipe shall remain exposed. Give all exposed ferrous pipe threads, after being installed and tested, one (1) coat of red lead and oil paint. Cut all copper tubing with square ends, and remove all burrs and fins. Carefully handle and protect tubing and replace all tubing cut, dented, or otherwise damaged with new tubing. Clean end of tubing and fittings by wire brush or abrasive. Apply a non-corrosive rosin-type flux to the outside surface of tubing ends, and on the recess inside of fittings. Remove stems and washers of solder-joint type valves before soldering. Provide unions and union type connections and shut-off valves for all fixtures and equipment for ready disconnection. On ferrous pipe 3-inches in diameter and smaller, unions shall be 150 psig steam working pressure zinc-coated malleable iron ground-joint type. On ferrous pipe 4 inches in diameter and larger, unions shall be 125 psig steam working pressure forged steel flange type, with gaskets of 1/16-inch-thick best quality rubber or cloth inserted rubber. On sanitary piping, tucker connections may be used. Support pipe and tubing hung from structure by heavy adjustable hangers. All hangers and collars shall be of the sizes suitable for the weight of the pipe and tubing. Make all changes in sizes of pipe and tubing with reducing fittings. Provide dielectric fittings at transitions between ferrous and copper piping.

- G. PVC pipe and fitting joining method shall be per the manufacturer's written instructions. PVC pipe and fitting shall not penetrate or be installed in any part of return- air plenums. Piping located in air plenums shall conform to NFPA 90A requirements. Piping located in shafts that constitute air ducts or that enclose air ducts shall be noncombustible in accordance with NFPA 90A.
- H. Water Systems: Install water systems with a fall towards the shut-off valve or the lowest fixture. Provide branches from hot and cold water lines to all fixtures, water heating units, and outlets indicated. Parallel Pipes: Where several pipes are run together, they shall run parallel and shall be spaced at distances which will permit access for servicing, unless provisions for pitching the pipes dictate different elevations.
- I. Sanitary Systems: Provide sanitary systems where practicable, with Wye fittings and 1/8 or 1/16 bends or combination Wye and 1/8 bends. All fixtures not specified to be provided with traps as integral parts of their outfits and all drains shall have separate traps with cleanouts. Waste lines shall be not less than 1-1/2 inches in diameter above grade and 2" below grade. Individually vent all fixtures or connect to a vented soil or waste line. Unless indicated otherwise, sanitary piping shall form circuit or loop vents with no dead ends or inverted siphons. Connect circuit or loop vent lines at a height of not less than 12 inches above the fixtures served. Horizontal vents shall slope down to waste or soil branch or stack. Grade horizontal soil and waste piping 1/4 inch per foot for piping 2-1/2" and less in size and 1/8 inch per foot for piping 3" and larger. Extend vertical stacks full size to not less than 12 inches above the roof and place in position before the roofing is applied. Where practicable, two (2) or more vent lines may be connected and extended as one (1) pipe through the roof. Install cleanouts at the foot of each soil or waste line, at changes in direction in lines, and where indicated; however, within the building, the distance between cleanouts in horizontal runs shall in no case exceed 75 feet. Extend cleanouts in floors full size to the floor level with outlets fitted with extra heavy cast brass or cast iron ferrule with countersunk caps, except no cleanouts shall exceed 6 inches in diameter. See detail on plans.
- J. Water Valves: Install water valves in accessible places and locate as follows:
1. Shut off valve on each building supply main, all sub-mains and to each fixture not provided with compression stop or with other auxiliary shutoff valve at the bottom of each riser of all hot and cold water lines, and where indicated.
- K. Installation of Fixtures: The Contractor shall provide all necessary material and labor to connect the plumbing system and all fixtures and equipment having plumbing connection, as specified in other sections of these specifications. Trap drainage connections. Equip the supply line to each item of equipment or fixture, except faucets, flush valves, or other control valves which are supplied with an integral stop, with a cutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Anchor supply piping to all fixtures, shower heads, and flush valves to prevent movement. Make connections between the earthenware of fixtures and the flanges on soil pipe gas and watertight with a one-piece special molded plastic gasket. Do not use all bulk material including putty and plastics for gaskets. Secure floor drains to the waterproofing or flashing in watertight manner. Caulk all fixtures to wall/floor with white grout.
- L. Pipe Sleeves: Provide pipe sleeves where pipes and tubing pass through walls, floors, roofs, and partitions. Place sleeves during construction of the building and at no time shall jackhammers be used. Space between pipe, tubing, or insulation and the sleeve shall be not less than 1/2 inch. Securely hold sleeves in proper position and location before and during construction. All sleeves shall be of sufficient length to pass through entire thickness of walls, partitions, or slabs. Sleeves in floor slabs shall extend 2 inches above the finished floor. Firmly pack space between the pipe or tubing on both ends of sleeve with firestopping materials listed by UL for the assembly in which located. Provide sleeves located in waterproofed construction with flanged end clamping ring.
- M. Supports and Fastening: Secure fixtures, trimmings, accessories, and appurtenances to concrete

and brick by 1/4 inch brass expansion bolts not less than 4 inches long, to terra cotta and concrete masonry units by 1/4 inch brass toggle or through bolts, to wood by not less than No. 12 round-head brass wood screws, and to gypsum with steel plates 1/8 inch thick, 6 inches wide, and not less than 24 inches long at the back of the through bolts. Expansion bolts shall be of a length sufficient to extend at least 3 inches into solid concrete or brickwork. Provide through bolts with plates or washers at the back and set so that heads, nuts, and washers are concealed by the plaster. Exposed heads of bolts and nuts shall be nickel-chromium plated hexagons with rounded tops. Provide nickel-chromium plated brass washers where necessary. Do not use plastic anchors to carry any load.

N. SEISMIC REQUIREMENTS

1. All design calculations shall be prepared by a registered professional engineer experienced in seismic design. All designs and calculations shall be submitted to Resident Engineer for review.
 2. Equipment supports and anchoring shall be designed to withstand the seismic forces computed. When such forces are applied, the equipment shall not be displaced or overturned, and shall not be made inoperable. Anchorages shall conform to recommendation of equipment manufacturer. When equipment is subject to thermal expansion, anchoring design shall allow this expansion.
 3. Piping Supports and Anchoring: Upon application of seismic forces of computed intensity, piping shall remain fully connected into operable systems and shall not be displaced sufficiently to damage adjacent or connecting equipment, or building members. Thermal expansion flexibility shall not be impaired.
 4. Seismic Design of Equipment: The following equipment shall be designed to resist the seismic forces computed:
 - a. Tank type water heaters.
 - b. Water piping above ceiling.
 - c. Aboveground drain and vent piping.
 5. Equipment shall be designed to be safely operable immediately after application of seismic forces.
- O. Field Tests, Inspections, and Disinfection: The Contractor shall perform all field tests and shall provide everything required for the tests. The Architect/Engineer will witness all field tests and conduct all field inspections. The Contractor shall give the Architect/Engineer ample notice of the dates and times scheduled for tests. Any deficiencies found shall be rectified and work affected by such deficiencies shall be completely retested at no additional cost to the Owner.
1. Inspection: Inspection shall continue during installation and testing. The right is reserved to inspect any equipment at the manufacturer's facility, during or after manufacture, and to require reasonable witness tests before shipment. Perform a final inspection of the equipment prior to installation to determine conformity to the type, class, grade, size, capacity and other characteristics specified herein or indicated. Correct or replace all equipment rejected prior to installation.
 2. Water Distribution Piping Test: Before fixtures are set, subject the entire hot and cold piping systems to a hydrostatic pressure test of 150 pounds per square inch with water for not less than two hours in order to permit inspection of all joints with no evidence of leakage. Where a portion of the water distribution piping is to be concealed before completion, test this portion separately as specified for the entire system.
 3. Sanitary Waste and Vent Piping Test: Before the installation of any fixtures, cap the ends of the system and all lines, fill with water to the roof, and allow to stand for at least 30 minutes without leakage. Make tests within building with piping exposed. If the system is tested in sections, tightly plug each opening, except the highest opening of the section under test, and fill each section with water and test with at least a 10-foot head of water. Test underground piping before backfilling with at least a 10-foot head of water.

4. Sanitary Drainage, Vent and Fixture System Final Test: Give sanitary, drainage vent, and fixture systems after complete installation an in-service test. After all fixtures are installed, test the entire vent and sewer system and prove gas and water tight. Final test shall be the smoke test. Before proceeding with test, fill all traps with water. Accomplish smoke test by filling the entire sewer system with a pungent thick smoke produced by one or more smoke machines. When smoke appears at stack openings on the roof, close openings and exert a pressure equivalent to a one-inch water column and maintain for 15 minutes before inspection for evidence of leakage starts. A positive test, which reveals leakage, shall be the detection of the odor of smoke at any point on the system. If a test reveals leakage of smoke repair and retest the system.
5. Disinfection of Water Distribution System: After pressure tests have been made, thoroughly flush the entire domestic water distribution system with water until all entrained dirt and mud have been removed, and sterilize by chlorinating material. The chlorinating material shall be either liquid chlorine conforming to Fed. Spec. BB-C-120, or hypochlorite conforming to Fed. Spec. O-C-114, or Fed. Spec. O-S-602, Grade 1 (5 percent available chlorine) or Grade 2 (10 percent available chlorine). The chlorinating materials shall provide a dosage of not less than 50 parts per million and shall be introduced into the system or part thereof in an approved manner. Retain the treated water in the pipe for 24 hours, or fill the system or part thereof with a water-chlorine solution containing at least 200 parts per million of chlorine and allow to stand for 3 hours. Open and close all valves in the system being disinfected three times during the contact period. Then flush the system with clean potable water until the residual chlorine is reduced to less than 1.0 p/m. During the flushing period open and close all valves and faucets three times. Have three (3) random samples from systems tested by independent testing laboratory approved by the State Health Department and deliver certificates of approval to Architect, County Sanitarian, and Engineer. Take samples no sooner than 24 hours after flushing, and analyze in accordance with AWWA C601. All laboratory fees are to be included in the Plumbing Contract. The Contractor will be responsible for preventing use of water from systems for human consumption until tested and approved. Should any of the reports prove unfavorable, the entire disinfection and sampling process shall be repeated.

NOTE: Certificates indicating negative results of bacteriological tests MUST BE PROCURED before building can be accepted.

END OF SECTION 15400

SECTION 15463 - HIGH EFFICIENCY WATER HEATER - GAS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Work in this section shall include water heater as indicated on the drawings and specified herein. Included shall be all materials and appurtenances as required for a complete installation.
- B. Provide and install piping, valves, trim indicated or specified on the drawings, and with factory installed ASME rated and approved temperature and pressure relief valve. Mount unit as noted on the details and drawings.
- C. Provide and install Schedule 40 PVC vent system including flashing and windproof cap. See detail on drawings. Venting shall be installed in strict accordance with manufacturers installation recommendations.
- D. Provide and install gas piping system from meter to water heaters. Pipe and fittings shall be furnished and installed per Specification section 15161.
- E. Provide seismic restraint bracing in accordance with IBC code requirements.

1.2 WARRANTY

- A. The water heater manufacturer shall warrant all electrical components against defects in workmanship and material for a period of one (1) year from date of acceptance, and the storage tank for three (3) years, non pro-rated, from date of acceptance.

PART 2 - PRODUCTS

2.1 WATER HEATER

- A. Tank shall have a porcelainized glass lined tank and be tested to 150 psi test pressure. Water heater shall be insulated with extra thick insulation in accordance with ASHRAE 90-75 and be approved for 0" clearance to combustibles.
- B. Controls shall include a gas pressure regulator, automatic gas control valve with adjustable thermostat, integrated solid-state temperature and ignition control device with integral diagnostics, graphic user interface, fault history display and digital temperature readout.
- C. Water heater shall meet or exceed the energy efficiency requirements of ASHRAE/IESNA 90.1-1999 with up to 96% thermal efficiency.
- D. The heater shall be supplied with a factory installed ASME rated temperature and pressure relief valve. Temperature/Pressure relief valve shall have a temperature setting of not more than 212 ° F. and a pressure setting not exceeding the tank or water heater manufacturer's rated working pressure or 150 psi, whichever is less. The relieving capacity of each pressure relief valve and each temperature relief valve shall equal or exceed the heat input to the water heater or storage tank. Pipe relief valve discharge to floor drain, or as indicated.

- E. The water heater shall be design-certified by UL (Underwriters Laboratories), according to ANSZ21.10 standards governing storage-type water heaters, meet ASHRAE/IESNA 90.1-1999, be design-certified by Underwriters Laboratories for 180° F (62° C) water and meet SCAQMD Rule 1146.2 for low-NOx emissions.
- F. The water heater shall be a standard product of a manufacturer regularly engaged in the design, testing, assembly, and cataloging of complete UL approved units. Products as may be available from the following list equivalent to the specified manufacturer's model on the drawings and comparing with specified requirements herein are acceptable:
 - 1. A.O. Smith Corporation
 - 2. Lochinvar Water Heater Division
 - 3. Bradford White
 - 4. Rheem Commercial
 - 5. State Industries, Inc

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Water heater shall be installed as indicated and per manufacturer's written instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances. Orient so controls and devices needing servicing are accessible.
- B. Water heater shall be installed as indicated and per manufacturer's written instructions, using dielectric unions at connections to water distribution system(s) or brass nipples.
- C. Vent Connections: Connect gas-fired water heater direct-vent to the exhaust and intake system using schedule 40 PVC piping. Provide the air intake and exhaust on the unit with a mesh screen to prevent large particles from entering the unit. Unless otherwise indicated provide vent same size as outlet on heater. Comply with manufacturer and gas utility requirements. The vent system must terminate so that proper clearances are maintained as cited in local codes or the latest edition of the National Fuel Gas Code, ANSI Z223.1/NFPA 54. To prevent condensate buildup in the exhaust vent pipe, the pipe shall be installed with a 1/8 inch per 5 feet of pipe maximum downward slope. The vent system shall be supported every 5 feet of vertical run and every 3 feet of horizontal run of vent pipe length.
- D. Use type "L" copper to pipe temperature and pressure relief valve and drain pan to floor drain or as indicated on the drawings.
- E. Water heater shall be installed as indicated and per manufacturer's written instructions, using dielectric unions at connections to water distribution system(s) or brass nipples.
- F. Install piping adjacent to equipment arranged to allow servicing and maintenance.
- G. Connect hot and cold water piping to the water heater with ball valves and unions. Connect hot water circulating piping to the heater with ball valves, check valve, and union.
- H. Set thermostat to deliver 140°F water temperature to the mixing valve.
- I. Provide drain valve, mixing valve, vacuum breaker, bronze circulating pump, immersion aquastat to control recirculation pump, thermometer, pressure gauge and ASME expansion tank as specified on drawings.

- J. Connect gas supply piping to burner with drip leg, tee, gas cock, and union; minimum size same as inlet connection. Arrange piping to allow servicing of unit.
- K. Install gas pressure regulators where indicated.
- L. Install vent piping from gas train pressure regulators and valves to outside the building. Terminate vent piping with brass screened vent cap fitting. Do not combine vents except with approval of local authority.
- M. Vent Connections: Connect gas-fired water heater draft hood to the vent system. Unless otherwise indicated provide vent same size as outlet on heater. Comply with gas utility requirements.
- N. Electrical Connections: Power wiring and disconnect switches are specified in Division 16. All power wiring and final connections shall be by the Electrical Contractor. All control wiring shall be by the Plumbing Contractor and material used shall comply with Section 16000 of this specification.

3.2 TEST

- A. Conduct water heater operational test and train maintenance personnel on procedures and schedules related to start-up and shutdown, troubleshooting, servicing, and preventative maintenance. Start up and training shall be performed by a factory trained representative of the heater manufacturer. Furnish Engineer and Owner a copy of the start up report.

END OF SECTION 15463

SECTION 15490 - PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

- A. All fixtures and accessories shall be new and first quality product of a single manufacturer conforming to specifications herein. Fixtures shall be installed to manufacturer's written instructions. Where written instructions are not provided, fixtures shall be installed to a first class installation and be in perfect condition. Fixtures shall be supplied complete with supply pipes, individual fixture stop valves, traps, bolt caps, faucets, vacuum breakers, strainers, set screw type escutcheons, nipples, tubing covers cut to correct length, supports and hole punching correct for faucet furnished, etc., as required. Metal parts to be heavily chromium plated, including traps, exposed pipe, and escutcheon plates. Upon completion of all work, thoroughly clean and adjust all fixtures and faucet aerators.
- B. All fixtures of like kind shall be the product of same manufacturer.
- C. All vitreous china fixture colors shall be as selected by the Architect.
- D. All electric water coolers, drinking fountains, bubblers, faucets, hot and cold water dispensers, ice makers, supply stops, and end point control valves shall comply with requirements of ANSI/NSF Standard 61. Certification of NSF compliance shall be displayed on these products or their packaging.
- E. All spaces between fixtures and walls, counter tops, or floors shall be sealed with a white non-hardening paintable caulking compound.
- F. Contractor shall anchor lavatories and water coolers to the wall or chair carrier at bottom so as to prevent "Lifting" off the carrier fittings.

PART 2 - PRODUCTS

2.1 REQUIREMENTS

- A. All exposed piping and metal work in connection with fixtures shall be chromium-plated brass.
- B. Whenever possible the supply and/or drain pipes shall connect to walls and not to floors, and all exposed junctions to walls shall have chromium plated escutcheons, flanges, or thimbles required, neatly and firmly secured in place.
- C. Connections between brass and cast iron soil and waste piping shall be made in compliance with the regulations and requirements of the local authority having jurisdiction.
- D. Provide polished chrome plated traps, wall nipples, and supply stops for all plumbing fixtures. P-traps shall be 17 gauge and have cast brass nuts and cleanout plug. Provide setscrews in all wall escutcheons.
- E. All fixtures shall be adequately supported; each floor-mounted fixture shall be set solidly upon the floor, bearing evenly on its entire base; each wall-hung fixture shall be supported by tubular carriers bolted to the floor with wall plates and bolts.

- F. Closet seats shall be heavy-duty solid plastic, open front, round or elongated to match bowl, have self-sustaining stainless steel check hinges. Seats shall be Bemis #1655-SS/C for elongated bowls and #955-SS/C for round bowls. Equals by Beneke, Olsonite, or Church.
- G. Flush valves shall be furnished at each water closet and urinal. Valves shall be exposed, with non hold open handles, screw driver stop, vacuum breaker, adjustable tailpiece, sweat solder adapter, vandal proof cap, set screw in the escutcheon.
 - 1. Water closet valves shall be as listed in fixture schedule, equals by Sloan Regal or by Zurn.
 - 2. Urinal valves shall be as listed in fixture schedule, equals by Sloan or by Zurn are acceptable.
- H. Flush valve handles on all handicapped water closets shall be turned to the wide side of the toilet area, room, or stall. The height of the flush valve handle for handicapped water closets and urinals shall not be above 44" AFF and shall comply with ADA requirements.
- I. Flush valves for all water closets and urinals shall be furnished with a stand off bracket, solid ring, and threaded rod, similar to "YK" variation. The bracket to be field installed on supply tube as high above fixture and under the diaphragm of each flush valve.

2.2 FIXTURE LIST

- A. Fixtures listed are those of American-Standard. Approved equals by Zurn, or Kohler are acceptable.
- B. Stops, supplies, grid drains, continuous waste, and P-traps shall be by McGuire. Equals by Zurn, EBC, or Dearborn Brass will be acceptable.
 - 1. Traps shall be 1-1/4" x 1-1/2" for lavatories; model #TA-140-CF, or equal.
 - 2. Traps shall be 1-1/2" x 1-1/2" for sinks; model # TA-150-CF, or equal.
 - 3. Sink waste shall be model #WE150L16 or #WE150L21 end outlet for 16" or 21" centers.
 - 4. Fixture supplies shall be #LA-10-CF for lavatories, #LA-12-CF for sinks, #CA-10-CF for water closets, and #LSH-15-BKWC for handicapped lavatories.
 - 5. Strainers shall be #SG7 for lavatories, #SB-8H for sinks, #7WC for handicapped lavatories, and #SB8CWC for handicapped sinks.

2.3 HANDICAPPED PROTECTION

- A. Furnish and install at each handicapped accessible lavatory or sink a model #102-W Handi-Lav-Guard Insulation Kit as manufactured by Truebro. At offset strainer handicapped lavatories provide model #105-W.
- B. Equal products by Brocar Products Inc, Engineered Brass Company, McGuire, Zurn Industries, or Dearborn Brass may be used.
- C. All trap and supply insulators shall be smooth, white, flame retardant vinyl, and comply with latest requirements of the Americans with Disabilities Act (A.D.A.).

END OF SECTION 15490

SECTION 15510 - SPRINKLER SYSTEM, WET PIPE

PART 1 - GENERAL

1.1 RELATED WORK

- A. Attention is directed to Sections 15000, and 15015 which applies to this Section, with the additions and modifications specified herein. General and Special Conditions apply.

1.2 QUALIFICATIONS OF INSTALLER

- A. Prior to installation, the Prime Contractor shall submit data for the approval of the Engineer which will show that he has successfully installed sprinkler systems of the same type and design as specified herein, or that he has a firm contractual agreement with a subcontractor having such required experience. The data shall include the names and locations of at least four installations where the Contractor, or the subcontractor referred to above, has installed such systems. The Contractor shall indicate the type and design of these systems and certify that these systems have performed satisfactorily in the manner intended for a period of not less than 18 months.

1.3 GENERAL REQUIREMENTS

- A. The work includes the designing and providing of approved automatic wet pipe sprinkler system per requirements of the Fire Protection Sprinkler System Specification Sheet (FPSSSS) for hazard and density requirements for the parts of the building indicated (FPSSSS Attachment 1). The design, equipment, hydraulic calculations, materials, installation and workmanship shall be in strict accordance with the required and advisory provisions of NFPA 13, except as specified otherwise herein. System shall include all materials, accessories and equipment inside and outside the building necessary to provide the system complete and ready for use. The system shall be designed and installed to give full consideration to built-in spaces, piping, electrical equipment, ductwork and all other construction and equipment to afford complete coverage and be free from operating and maintenance difficulties, all in accordance with detailed drawings to be submitted by the Contractor to the Engineer for review and approval, final approval by the State Office of School Facilities, State Fire Marshal and the Local Fire Marshal. Devices and equipment shall be of a make and type listed by the Underwriters Laboratories, Inc., or approved by the Factory Mutual Laboratories. In each of the NFPA Standards referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" had been substituted for "should" where it appears; reference to the "authority having jurisdiction" shall be interpreted to mean the State Fire Marshal or Local Fire Marshal. The work shall begin at the point indicated.
- B. Submittals Required: Before any work is commenced, the Contractor shall submit a complete set of working drawings of the sprinkler system, hydraulic calculations, and full descriptive data for pipe, fittings, alarm valve, gate valves, check valves, water-motor alarms, sprinkler heads, hangers, devices, materials, and associated equipment to the inspection bureau having jurisdiction and Owner's insuring agent, obtain stamped approved plans and letter of approval, and then submit the approved drawings and letter of the above agencies to the Engineer for his review. Partial submissions will not be acceptable. Descriptive data shall be annotated to show the specific model, type and size of each item the Contractor proposes to furnish. The drawings shall be in accordance with the requirements for "Working Plans" as specified in NFPA 13 and shall include all applicable data specified therein. No work shall begin until the design of the system and the various components have been reviewed by the Engineer and approved by the State Fire Marshal and Local Fire Marshal.
- C. Instruction Manuals: Contractor shall furnish instruction manuals containing complete instructions for the specific make and model of the alarm valve and associated equipment furnished. One (1)

copy of each instruction manual shall be placed in a flexible oil-resistant protective binder and mounted in an accessible location in the vicinity of the alarm valve. Three (3) additional copies of instruction manual shall be furnished to the Owner.

1.4 DESIGN OF SPRINKLER SYSTEMS

- A. Design of the wet pipe sprinkler system shall be hydraulically calculated and shall conform to NFIPA 13 and to the requirements as specified hereinafter.
- B. Sprinkler Heads: Heads shall have nominal 1/2-inch orifice. Release element of each head shall be of the intermediate temperature rating or higher as suitable for the individual location where it is installed. Finish of ceiling plates and pendent sprinklers below suspended ceilings shall be chromium plated. Provide sprinkler head guard on sprinklers located in equipment and storage rooms as well as noted on drawings. All heads shall be "quick response" type.
- C. Cabinet: Sprinkler heads and sprinkler head wrench shall be provided in a cabinet at an accessible location adjacent to the alarm valve. The number and types of extra sprinkler heads shall be as specified in NFIPA 13.
- D. Alarm Valve: Valve shall be of the variable pressure type complete with all accessories and appurtenances necessary for the proper operation of the system and to prevent false alarms due to surges or other conditions in the supply to each system.
- E. Distribution of Water: Distribution shall be essentially uniform throughout the area in which it is assumed the sprinkler heads will open. Variation in discharge from individual heads in the hydraulically most remote area shall be between 100 and 120 percent of the specified density.
- F. Density of Application of Water: Application to horizontal surfaces below the sprinkler shall be in accordance with NFIPA 13. Pipe shall be sized to provide the required density when the system is discharging the total maximum required flow.
- G. Sprinkler Discharge Area: Area shall be the hydraulically most remote as defined in NFIPA 13.
- H. Friction Losses: Losses in pipe shall be calculated in accordance with the Hazen and Williams formula with 'C' value of 120 for aboveground steel pipe, 140 for aboveground copper pipe, and 120 for underground cement lined cast iron pipe and asbestos cement pipe.
- I. Water Supply: Hydraulic calculations shall be based on information provided on the Sprinkler Specification sheet.
- J. Contractor shall use 15 feet per second as the maximum allowable velocity of water flow through any part of the piping system.

PART 2 - PRODUCTS

2.1 ALARMS

- A. Water Motor Alarm: Alarms of the approved weatherproof and guarded type, to sound locally on the flow of water in each sprinkler system, to which it is connected, shall be mounted on the outside of the outer walls of the building, at a location designated by the Engineer.
- B. Flow Switch: Switch with circuit opener or closer for the automatic transmittal of an alarm over the facility fire alarm system shall be provided and shall be connected into the fire alarm system. Alarm actuating device shall be of the mechanical paddle water flow type which instantly recycles when water is moving in the system.

2.2 ABOVEGROUND PIPING SYSTEMS

- A. Fittings shall be provided for changes in direction of piping and for all connections. Changes in piping sizes shall be made through standard reducing pipe fittings; the use of bushings will not be permitted. Jointing compound for pipe threads shall be pipe cement and oil, or graphite and oil. Short pipe nipples shall be extra strong, schedule 80 black steel.

2.3 SPRINKLER PIPING

- A. Piping shall conform to NFPA 13 except water motor alarm drain piping shall be zinc coated. Use of restriction orifices will not be permitted.
- B. All above ground pipe shall be seamless, schedule 40 black steel pipe WITH continuous pipe identification markings visible from the floor. Schedule 10 is not allowed.
- C. The use of cpvc is not approved.
- D. All pipe and fittings shall be domestic in origin.

2.4 VALVES

- A. Valves shall be provided as required by NFPA 13 and of types approved for fire service. Gate valves shall open by counter clockwise rotation. Check valves shall be flanged clear opening swing check type with flanged inspection and access cover plate.
- B. Backflow preventer shall conform to ASSE 1015, AWWA C506, and shall be approved by the Department of Health and Environmental Control. See civil plans.

2.5 IDENTIFICATION SIGNS

- A. Properly lettered approval metal signs conforming to NFPA 13 shall be attached to the valve and alarm device.

2.6 INSPECTOR'S TEST CONNECTION

- A. Test connections shall be provided 6 feet above the floor of the sprinkler system and shall be located at the alarm valve. Test connection shall be piped to a location where the discharge will be readily visible and where water may be discharged without damage.

2.7 MAIN DRAINS

- A. Drains shall be 2" piped to discharge at safe points outside of the building or to sight cones attached to drains of adequate size to readily care for the full flow from each sprinkler drain under maximum pressure. Auxiliary drains shall be provided as required by NFPA 13.

2.8 SLEEVES

- A. Standard weight zinc coated steel pipe sleeves shall be provided for all pipes passing through masonry walls, and ceilings. Sleeves shall extend completely through construction. Space between sleeves and pipe shall be firmly packed with oakum and calked both ends at smoke walls and with fire insulating material at rated walls.

2.9 ESCUTCHEON PLATES

- A. Sprinkler piping passing through floors, walls and ceilings shall be provided with approved type, one (1) piece seismic escutcheons. Plates where pipe passes through finished ceilings shall be chromium plated. Other plates shall be of steel or cast iron, with aluminum finish. Plates shall be securely anchored in place with setscrews or other approved positive means.

2.10 UNDERGROUND PIPE AND FITTINGS

- A. Piping from the existing water main and piping under the building shall be outside coated cement lined cast iron pipe and fittings conforming to NFIPA 24, with the joints anchored in accordance with NFIPA 24. Minimum pipe size shall be 6 inches. Minimum depth of cover shall be 3 feet. See civil.
- B. Valves shall be provided as required by NFIPA 13 and of types approved for fire service. Gate valves shall conform to AWWA C500 with cast iron body and bronze trim, and shall open by counterclockwise rotation. See civil.

2.11 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS

- A. Connect to fire line as indicated and noted on drawings, see civil plans for the project.
- B. Contract starts at flange in riser room 12" above the slab.

2.12 DISINFECTION

- A. New water piping and existing water piping affected by the Contractor's operation shall be disinfected in accordance with AWWA C601. Piping systems shall be filled with solution containing minimum of 50 parts per million of available chlorine and allowed to stand for minimum of 24 hours. Solution shall be flushed from systems with clean water until maximum residual chlorine content is not greater than .01 parts per million.

2.13 FIELD PAINTING

- A. New sprinkler EXPOSED valves, piping, conduit, hangers, miscellaneous metalwork and accessories shall be painted. Paint shall be applied only to clean dry surfaces using clean brushes. Immediately after cleaning, the metal surfaces shall receive one coat of pretreatment primer conforming to MIL-P-15328 applied to a minimum dry film thickness of 0.3 mil, and one (1) coat of primer conforming to Fed. Spec. TT-P-645 applied to a minimum dry film thickness of one mil. Due care shall be exercised to avoid the painting of the sprinkler heads or protective devices. Materials which are used to protect sprinkler heads, while painting is in process, shall be removed upon the completion of painting. The Contractor shall remove all sprinkler heads which are painted and shall provide new clean sprinkler heads of the proper type at his own expense. Primer surfaces color shall be RED.
- B. CONCEALED new sprinkler piping shall have pipe identification markers applied 20' on center, on each side of all walls, and on each side of floor penetrations. A minimum of one (1) marker per space. See Specification Section 15100.

2.14 ELECTRICAL

- A. Electrical work is specified in Division 16.
- B. Control wiring, including connections to fire alarm systems, shall be provided under this section and shall conform to NFIPA 70. The conduit shall be rigid zinc coated steel, except EMT conduit may be used in dry locations not enclosed in concrete or where not subject to mechanical damage.

2.15 HANGERS

- A. Contractor shall space hangers per requirements of NFPA 13.
- B. All hanger components and threaded rods shall be galvanized steel.

PART 3 – EXECUTION

3.1 FIELD TESTING AND FLUSHING

- A. Field tests to determine conformance with the specified requirements shall be performed in the presence of the Engineer. The system shall be hydrostatically tested at 200 psig for a period of 2 hours, and underground piping shall be flushed in accordance with NFPA 13. Alarms and other devices shall be tested, the waterflow alarms being tested by flowing water through the Inspector's test connection. When hydrostatic and alarm tests have been completed and all necessary corrections made, the Contractor shall submit to the Engineer a signed and dated certificate, similar to that specified in NFPA 13, with a request for a formal inspection by the Engineer. The request for formal inspection shall be submitted at least five working days prior to the date the inspection is to take place. A competent representative of the sprinkler installer shall be present during the inspection. At this inspection, any or all of the required tests shall be repeated as directed by the Engineer. All defects shall be corrected by the Contractor at his own expense and additional tests made until it has been demonstrated that the systems comply with all contract requirements. All appliances and equipment for testing shall be furnished by the Contractor and all expenses in connection with the tests shall be defrayed by him. Water for testing will be furnished by the Contractor.

3.2 FIELD TESTING AND FLUSHING

- A. Field tests to determine conformance with the specified requirements shall be performed in the presence of the Engineer. The system shall be hydrostatically tested at 200 psig for a period of 2 hours, and underground piping shall be flushed in accordance with NFPA 13. Alarms and other devices shall be tested, the waterflow alarms being tested by flowing water through the Inspector's test connection. When hydrostatic and alarm tests have been completed and all necessary corrections made, the Contractor shall submit to the Engineer a signed and dated certificate, similar to that specified in NFPA 13, with a request for a formal inspection by the Engineer. The request for formal inspection shall be submitted at least five working days prior to the date the inspection is to take place. A competent representative of the sprinkler installer shall be present during the inspection. At this inspection, any or all of the required tests shall be repeated as directed by the Engineer. All defects shall be corrected by the Contractor at his own expense and additional tests made until it has been demonstrated that the systems comply with all contract requirements. All appliances and equipment for testing shall be furnished by the Contractor and all expenses in connection with the tests shall be defrayed by him. Water for testing will be furnished by the Contractor.

3.3 CLOSE OUT REQUIREMENTS

- A. Contractor shall compile and turn over signed copies of the Contractors Material and Test Certificate to the Owner, Architect, and Engineer.
- B. Contractor shall furnish a letter stating that all tamper and flow switches have been powered, tested, and are now active.

- C. Contractor shall furnish copies of the UL designed fire stopping furnished and installed on the project.
- D. Contractor shall provide evidence that he has delivered a copy of NFPA 25, 2007 edition to the Owner.

ATTACHMENT 1

FIRE PROTECTION SPRINKLER SYSTEM SPECIFICATION SHEET

END OF SECTION 15510

SECTION 15657 - GAS-FIRED UNIT HEATERS

PART 1 - GENERAL

1.1 SCOPE

- A. Work includes furnishing and installation of gas-fired unit heaters and associated controls.

1.2 WORKMANSHIP

- A. Only skilled and experienced workmen shall be utilized for this work. Any work that is not performed in accordance with standards and recommended practices shall be replaced at the expense to the Contractor. Coordinate with all other contractors prior to installing any item of equipment.

1.3 CODES, FEES, ETC.

- A. Comply with International Mechanical Code, International Fuel Gas Code, ASHRAE Guide and local codes. Apply and obtain all permits and comply with local inspections requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Gas-fired unit heaters shall be as manufactured by Hastings, Reznor, Trane or Modine. Capacities shall be as indicated.

2.2 EXPRESS REQUIREMENTS

- A. The heat exchanger shall be 18 gauge stainless steel with 16 gauge aluminized stainless header plates as indicated. The seams shall be all electrically welded. The heat exchangers shall be guaranteed by the Manufacturer for a period of ten (10) years under normal operating conditions.
- B. The burners shall have stainless steel ribbon inserts and shall fire directly into the heat exchanger tubes. There shall be an easily opened access panel in the bottom of each heater for the removal of individual burners and pilot assembly.
- C. Unit heaters shall be provided propeller fans with internal overload protection and fan guards or with centrifugal blower and open drip proof motor with internal overload protection. All unit heaters shall have adjustable louvers for proper air diffusion.
- D. Cabinet side panels shall be of 20 gauge cold rolled steel. Side panels shall be finished with baked enamel.
- E. Gas and electrical components shall consist of not less than the following: 24 volt combination gas valve containing main and pilot gas cocks, main and pilot gas pressure regulators, redundant solenoid gas valves, pilot solenoid gas valve and 100% safety shut-off, high limit control and 115/24 volt control transformer.
- F. Provide power venters. Venter motor shall be permanently lubricated and provided with built-in switch and overload protection. Provide restricting orifices where required.

- G. Ignition shall be electronic with a fail-safe flame proving system to insure that gas valve is closed in absence of proven pilot.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Unit heaters shall be installed in a competent manner per manufacturer's written instructions and per local codes.

END OF SECTION 15657

SECTION 15805 - AIR DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 SCOPE

- A. All ductwork shall be galvanized steel.

1.2 SMACNA GUIDELINES AND CODES

- A. Complete systems of ductwork shall be fabricated and installed in accordance with the recommended and standard practices contained in the latest edition of the SMACNA "HVAC Duct Construction Standards – Metal and Flexible" as published by the Sheetmetal and Air Conditioning Contractors National Association, Inc.
- B. Comply with International Mechanical Code, ASHRAE Guide, and local codes.

1.3 QUALITY ASSURANCE

- A. SMACNA Standards:
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards, second edition".
 - 2. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual".
- B. ASHRAE Standards: Comply with ASHRAE Systems and Equipment Handbook.
- C. NFPA Compliance: Comply with NFPA 90A "Standard for the installation of Air Conditioning and Ventilating Systems" and NFPA 90B "Standard for the Installation of Warm Air Heating and Air Conditioning Systems".
- D. Filter media shall be ANSI/UL 900 listed, Class 1 or Class 2, as approved by local authorities.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Ductwork: Except as may be specifically noted otherwise on the drawings, ductwork shall be constructed of galvanized steel conforming to ASTM A 653 with a galvanized coating of not less than 1-1/4 ozs. per sq. ft. for both sides. Minimum ductwork gage shall be 26. Gage shall be indicated on the ductwork. Class 1 flexible duct, complying with UL 181 may be used at diffuser connections in lengths not to exceed 5 feet. Flexible duct is not permitted to connect main ducts to terminal boxes. Ductwork aspect ratios shall generally 3 to 1, not to exceed 4 to 1.
- B. Elbows: Long radius elbows shall be used generally; however, vaned elbows shall be used where shown on the drawings and/or required to fit restricted spaces. Turning vanes in ductwork 18" or deeper shall be double wall and 1 gage heavier than installed ductwork. Single wall turning vanes gage shall be equal to ductwork. Short radius elbows are prohibited unless authorized by Engineer.
- C. Accessory Materials: Material for bracing angles, hangers and supports, rivets, screws and other fastening details shall be galvanized steel.
- D. Balancing Dampers: Provide factory-fabricated balancing dampers with locking quadrants at all branch take-offs to facilitate balancing. Damper shall be 1 gage heavier than installed ductwork.

Do not install a volume damper with a frame that protrudes into an airstream due to excessive noise and pressure drop. Dampers that are integral parts of supply diffusers are not permitted for balancing. Provide dampers at branches or takeoffs for balancing. Bright colored ribbons shall be tied to the damper quadrant for locations to be quickly identified. Ribbon shall hang down a minimum of 12".

- E. Air Distribution Devices: Furnish and install exhaust and supply grilles, registers and air diffusers as shown on drawings and as specified herein. All air distribution devices shall be Titus, Price, or Metalaire.
 - 1. Sound Power Level: Grilles, registers and diffusers shall meet the noise criterion sound level of the scheduled air device ± 2 NC in the occupied area but not to exceed the NC occupancy recommendations in the ASHRAE Guide. Selection and sizing of all grilles, registers and diffusers shall conform to the manufacturer's published performance data and meet scheduled requirements.
 - 2. Ceiling Supply Air Diffusers: Shall be of design and air pattern indicated on the drawings with volume control key operated from the face of the device. Provide each supply register and diffuser with an air turning device for deflecting air evenly into the throat of the device. All diffusers and registers shall be of aluminum construction.
 - 3. Ceiling Supply Air Diffusers shall be provided with molded insulation blankets.
 - 4. Return Air Grilles: Shall be of aluminum construction with sponge rubber gasket.
 - 5. All supply air devices shall be complete with opposed blade volume control dampers when a balancing damper cannot be installed in an accessible location or as noted on the drawings.
- F. Fire Dampers: Provide UL Listed fire dampers of suitable arrangement at any point of fire-rated wall/ceiling penetration.
- G. Louvers: Wall louvers shall be by Metalaire, Pottorff, or United Enertech. Refer to the drawings for louver sizes and performance. All wall louvers shall be provided with aluminum bird screen or aluminum insect screen as indicated.
- H. Flexible duct connections shall be provided at inlet and outlet connections to air handlers and fans.
- I. Duct Sealing Requirements: All supply, return and exhaust ductwork shall be Seal Class B unless required by SMACNA to be Seal Class A. Transfer ducts may be Seal Class C.

PART 3 - EXECUTION

3.1 DUCTWORK AND ACCESSORIES

- A. Ductwork and accessories shall be installed in strict accordance with NFPA 90A and SMACNA HDCS and shall be run approximately as indicated on drawings. Provide offsets and other field changes as necessary to suit the size of factory fabricated equipment actually furnished. Such changes shall be designed to minimize losses in pressure and performance due to sudden expansion and contraction. Transitions shall be used in field changes as well as modifications to connecting ducts.
- B. Duct shall be installed so that ductwork shall operate without chatter, vibration and be airtight so that no dust marks from air leaks will show at connections or outlets. All joints shall be sealed with approved duct sealer.
- C. Elbows, vaned elbows, take-offs, branch connections, transitions, duct volume dampers, flexible connections, other fittings and appurtenances shall conform to SMACNA Duct Construction Manual.

D. Duct Supports:

1. Supports for concealed ducts shall be not less than 1 inch wide, 22 gauge, galvanized strap hangers spaced in accordance with SMACNA Duct Construction Standards. Hangers shall be installed under insulation with penetrations sealed with mastic. Ductwork 24" or wider shall be supported with angle iron held in place by threaded rod from structure. Angle iron and rod to comply with SMACNA standards based on size and weight of duct in addition to hanger spacing intervals.
2. Ducts shall be supported and installed so as to be completely free from vibration under all conditions of operation. Supports shall be attached only to structural framing members.

E. Round ducts shall be tapped into main duct with conical type fittings with volume dampers having a locking quadrant.

F. Branches and Tee Connections: Provide 45° boot taps for rectangular to rectangular connections. Provide conical taps for round to rectangular and round to round connections. Conical tees shall be acceptable for round to round connections. **Saddle taps are prohibited.**

G. Grille and Diffuser Connections: Adjustable dampers are included as accessories to be furnished with the air distribution devices.

H. Volume Dampers: Install all dampers so that they are accessible for adjustment. Extend damper rod beyond insulation and provide locking device. Conspicuously mark damper rod for quick identification.

I. Broken places in galvanized sheet metal coating made during forming shall be painted with zinc duct primer.

J. Access Doors: Shall be hinged and latched. Access doors shall provide ready access to operating parts of any kind. Make doors air tight with a neoprene gasket. Insulate doors in insulated ductwork.

K. Objectionable Noise, Vibration or Breathing of Ducts: Will not be permitted and the Contractor shall see that such objections are eliminated by anchoring and bracing all ductwork securely to building.

L. Cleaning of Ducts: Before making final connections to air distribution outlets, the Contractor shall operate fans and shall thoroughly clean out the interior surfaces of all ducts.

M. Flexible Duct Connections: Flexible connections shall be installed between fan units and metal ducts or casings, and shall comply with NFPA No. 90A.

N. Temporary closure shall be provided at ends of ducts which are not connected to equipment or air devices at the time of installation. Provide temporary closure of polyethylene film or similar covering to prevent dust and debris from entering ductwork. Ductwork that is awaiting installation on the job site shall be covered with the same temporary closure.

O. End runs of ductwork shall not extend more than 2" past last tap.

P. Slope exhaust duct connected to grilles in high moisture areas (showers, restrooms, pool areas, etc.) back towards grille. Slope shall be minimum 1/8" per foot.

3.2 TESTING

A. Operate all fans and demonstrate quiet and vibration-free operation of duct system.

- B. Air Cleaning Devices: Systems shall not be operated during construction.
- C. Leakage Tests: Mechanical Contractor to conduct duct leakage test on all ductwork constructed to 2" pressure class or higher. Refer to plans for ductwork pressure class schedule. Leakage test shall be in accordance with SMACNA HVAC Air Duct Leakage Test Manual. Repair leaks and repeat tests until total leakage is less than the maximum permissible leakage for the pressure class as listed on the plans.
- D. Test Failures: Duct systems shall be repaired if test pressure and leakage requirements are not met or if air noise condition is encountered. Repairs and sealing shall be done with sheet metal, tape, sealant, or a combination thereof.
- E. Ductwork pressure tests shall be observed by Architect/Engineer/Owner or their designee prior to installation of insulation. All testing shall be documented and submitted to the Owner.

END OF SECTION 15805

SECTION 15875 - SPLIT-SYSTEM HEAT PUMP

PART 1 - GENERAL

1.1 SCOPE

- A. Complete year-round, all electric heating and cooling system completed in all respects and ready for operation.

1.2 WORKMANSHIP

- A. Only skilled and experienced workmen shall be utilized for this work. Any work that is not performed in accordance with standard and recommended practices shall be replaced at the expense of the Contractor. Coordinate with all other contractors prior to installing any item of equipment.

1.3 CODES, FEES, ETC.

- A. Comply with International Mechanical Code, ASHRAE Guide and local codes. Apply and obtain all permits and comply with local inspection requirements.

PART 2 - PRODUCTS

2.1 INDOOR SECTION

- A. The indoor unit shall be a variable speed type designed for (R-410A) refrigerant, Trane model as scheduled. No substitute shall be accepted. Air handler shall be constructed of galvanized steel and coated with baked enamel finish. The cabinet shall be insulated with neoprene coated fiberglass. The cabinet panels shall be easily removed for service to all components. The indoor unit shall be complete with direct expansion coil, variable speed centrifugal fan and motor and condensate collector, and shall be completely wired to terminal block. The capacity shall be as scheduled on the drawings. The indoor unit shall be provided with filter frame and throw-away filters unless noted otherwise. Filters shall be replaced at job completion.
- B. The electric strip heater shall be a component part of the indoor unit and shall be the KW and electrical characteristics as scheduled on the drawings. Heaters shall be complete with thermal and overload protection, and including a 24-volt control transformer, insulated terminal box and contactor. In addition, the heater shall be provided with an air flow pressure differential control wired through the fan motor control circuit.

2.2 OUTDOOR SECTION

- A. The outdoor unit shall be a single or two-speed electric heat pump, as scheduled, designed for R-410A refrigerant, Trane model as scheduled. No substitutions shall be accepted.
- B. The casing shall be galvanized steel with baked enamel finish. The compressor shall be a two-speed welded hermetic type with internal vibration isolation and external neoprene mounts. The compressor shall have thermal and over-current protection, high pressure cut-out and crankcase heater.
- C. Condenser fan shall be multi-speed direct drive with vertical discharge propeller fan and fan/coil guards. Fan motor shall be permanently lubricated, inherently protected and resiliently mounted.

- D. Condenser coil shall be mechanically bonded fin and tube with changeover valve, quick attach refrigerant couplings, gauge taps, filter-drier and refrigerant metering device.
- E. Control shall be factory wired and shall include an anti-recycle timer control, outdoor thermostat, automatic defrost controls, control transformer, compressor contactor, and wiring terminal block with all components enclosed in a weatherproof compartment.
- F. Refrigerant tubing may be pre-insulated and pre-charged type as provided by the unit manufacturer. Where insulation is exposed to the weather, coat with vinyl lacquer two coats minimum.

2.3 HEAT PUMP SYSTEM

- A. The entire heat pump system shall consist of matched components rated in accordance with A.R.I. 240 and shall be UL labeled.

2.4 WARRANTY

- A. The units shall be warranted for all parts and labor for one (1) year from date of acceptance with an additional extended four (4) years warranty on the compressor. Register warranties with the manufacturer and provide Owner with copies.

2.5 ROOM THERMOSTAT

- A. Room thermostat shall be a Temperature and Humidity Controller type, seven (7) day programmable.

2.6 CONDENSATE DRAIN PIPING

- A. Piping shall be Schedule 40 PVC with solvent cemented joints. Provide P-trap at unit and insulate entire drain line with 5/8" thick foam plastic insulation, or 1" fiberglass with vapor barrier. Slope piping .25" per foot away from unit.

PART 3 - EXECUTION

3.1 HEAT PUMPS

- A. Heat pumps shall be installed as indicated and as recommended in the manufacturer's installation and operating instructions. Outdoor unit shall be mounted on a level concrete pad a minimum of 4" above surrounding grade.

3.2 AIR HANDLERS

- A. Mount air handler on cork-and-rubber vibration isolators or suspend from building structure with hangers having in-line spring isolators.
- B. Provide an auxiliary drain pan with liquid-tight seams for each air handler.
- C. Auxiliary drain pan shall be fitted with a normally closed float switch which shall disable the heat pump in the event of high water in the pan, and a 1" PVC pipe to discharge at a conspicuous location acceptable to the Building Official.

3.3 PAINTING

- A. Equipment and items with a factory applied finish shall have scratched, chips, etc., primed and touched up with paint to match color of equipment and/or items installed.

3.4 CLEANING AND ADJUSTMENTS

- A. Upon completion of work, clean, oil, and grease all fans, motors, other running equipment and apparatus and make certain that all such apparatus and mechanisms are in proper working order and made ready for tests.

3.5 TESTS

- A. Balance all supply direct/diffuser systems and provide complete air balance report to Engineer prior to requesting final inspection. Report shall be signed by a principal of the mechanical contracting firm.
- B. Start-up of heat pump systems and controls shall be performed by Trane certified factory service technician. System shall be set to operate in dehumidify mode.

3.6 CUTTING OF STRUCTURE

- A. Where it is required to cut any part of the structure for installation of equipment, the cutting shall be under the direction of the General Contractor.

3.7 ELECTRICAL

- A. All electrical work and materials shall conform to the requirements of Section 15010.
 - 1. Split-System Heat Pumps (Indoor Unit): Indoor unit and auxiliary strip heater shall be provided and installed by this Section. Indoor unit and strip heater shall be furnished with all operating and safety controls. This Section shall also provide and install all controls, control wiring, conduit, etc., and make connections required for complete installation.
 - 2. Control wiring shall be installed in conduit per Section 16100.
 - 3. Split-System Heat Pump (Outdoor Unit): Outdoor unit shall be provided and installed by this Section. The unit shall be provided with all operating and safety controls, conduit, wire, and shall connect electrically from load side of disconnect to outdoor unit. This Section shall also provide and install all the necessary controls, control wiring and conduit.
 - 4. Power wiring, including service disconnect, is provided under Division 16.

END OF SECTION 15875

SECTION 15895 - FANS

PART 1 - GENERAL

1.1 SCOPE

- A. Ventilating fans shall be of the size, type, arrangement, construction, performance accessories and electrical characteristics specified hereinafter and/or indicated on the drawings. Fans as may be available from Loren Cook equivalent to the specific manufacturer's model scheduled and complying with all other express requirements are acceptable.

PART 2 - PRODUCTS

2.1 ROOF-MOUNTED CENTRIFUGAL AND AXIAL FANS

- A. Shall have AMCA Certified Rating Seal, direct or belt drive as scheduled, aluminum construction, aluminum birdscreen, factory mounted disconnect switch and weatherproof construction. All aluminum backdraft dampers shall be provided unless specifically omitted by notation on the drawings.

2.2 CENTRIFUGAL CEILING FANS

- A. Shall have AMCA Certified Rating Seal, acoustically insulated cabinet, vibration proof grille and integral chatterproof backdraft damper. Provide wall caps and/or other accessories specified on the drawings.

2.3 IN-LINE CENTRIFUGAL FANS

- A. Fans shall be belt-driven in-line type. The square shaped fan housing shall be of heavy gauge galvanized steel. One of the sides shall be hinged and shall support the entire drive assembly and wheel allowing the assembly to swing out for cleaning, inspection, or service without dismantling the unit in any way. The motor shall be mounted on the hinged-side exterior isolated from the air stream. The belt and pillow block ball bearings shall be protected from the air stream by an enclosure. The shaft shall be keyed to both the wheel and pulley. The fan inlet shall be a spun venturi throat overlapped by a backward curved centrifugal wheel with spun cone for maximum performance. Air and sound shall be AMCA licensed.

2.4 PREFABRICATED ROOF CURBS

- A. Unless indicated otherwise, all roof-mounted fans and intake and relief air hoods shall be provided with 12" high insulated aluminum prefabricated roof curbs as manufactured by the fan or hood manufacturer. Curbs shall be suitable for the roof type used.

END OF SECTION 15895

SECTION 15990 - TESTING AND BALANCING AIR SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

- A. **The final test and balance is not in the mechanical contractors scope of work. A third party test and balance firm specializing in total system testing and balancing shall be contracted by the Owner to execute the final test and balance in accordance with the following specifications.** The balancing firm shall provide all labor, equipment, engineering and test equipment required to test, adjust, and balance all air, fluid, mechanical, control, and electrical systems associated with HVAC systems to optimum performance.
- B. The Mechanical Contractor shall provide a letter to the Owner stating the system(s) are complete and ready for test and balance.
- C. Any corrective action shall be completed by the Mechanical Contractor and the systems re-tested.
- D. The systems shall be balanced in the season of maximum cooling load and in the season of maximum heating load. Season 1 balancing shall occur prior to Owner's acceptance of the building. Season 2 balancing shall occur within 180 days of season 1 balancing and when outdoor ambient temperatures are 88 degrees Fahrenheit or higher for maximum cooling load and 40 degrees or lower for maximum heating load.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. General, Mechanical and Electrical Contractors shall coordinate and cooperate with the TAB contractors as necessary to allow them to perform work.
- B. Items such as start-up, initial testing, cleaning, calibration of controls, electrical testing, etc., are to be completed prior to the commencement of TAB work.

1.4 SUBMITTALS

- A. Procedure Submittal: Prior to commencing work, submit, for approval, a written procedure of how balance will be performed and a description and manufacturer's name of equipment and instruments to be used. The submittal shall include, but not necessarily be limited to the following:
 - 1. List of preliminary checks to be performed at the job site such as confirmation that manual volume dampers are present, filters are installed, frequency drive units operational, location of control sensors, etc.
 - 2. Identify how the air outlets will be measured and the type of instruments to be used.
 - 3. Locations of pitot traverses and the type of instruments to be used.
 - 4. Modes of operation that the system will be placed in during balancing and testing, i.e., full cooling and heating, maximum and minimum outside air flows, maximum and minimum sash positions for hoods, toilet fans on or off, etc.
 - 5. Operating static pressures for terminal devices and pressure sensors for controlled devices.
 - 6. Method of adjusting outside and return air quantities at air handling units.
 - 7. Initial test procedures for preliminary balance.
 - 8. Final test procedures.
 - 9. List of deficiencies in mechanical system that could hinder the balance work such as missing or leaky dampers, incomplete systems, inadequate fans, etc.
 - 10. Sample of data sheets and test forms to be used in final report.

11. Identification and manufacturer's name of equipment to be used on project and proof of last calibration on each piece.

- B. Progress Report(s) – Report, in writing, any deficiencies or problems with air or water systems that have affected balance work. Include items that affect system performance such as broken thermostats, damaged ductwork, excessive noise, etc.

1.5 QUALITY ASSURANCE

- A. Test, adjust, and balance systems in accordance with ASHRAE Applications Handbook. For NEBB certification, comply with "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems." For AABC certification, comply with "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems."
- B. TAB contractors shall present to the Owner, proof of current equipment certification approved by National Institute of Standards and Technology.
- C. Testing Agency Qualifications: Agency shall be NEBB or AABC certified in testing and balancing disciplines required for this project. Work shall be performed under direct supervision of a NEBB, or AABC certified supervisor.

1.6 WARRANTY

- A. Guarantee of Work: TAB contractor shall guarantee the balancing for a period of ninety (90) days from date of acceptance of final report. During this period, the TAB contractor shall make personnel available at no cost to the Owner to verify measurements and/or correct deficiencies in the balance. During this period, emergency adjustments shall not void this warranty.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Provide all test instruments, meters, gauges, power-measuring instruments, pumping equipment, temporary piping and miscellaneous items necessary to perform required testing procedures.
- B. Provide necessary dampers, thermometer wells, gauge cocks, balancing valves, and other appurtenances as required. Coordinate locations of these items as construction progresses to avoid disturbance of finished complete systems. Provide new sheaves and belts for air moving equipment, if required, to attain desired air quantities.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Pre-Balancing Meeting: Before beginning testing, adjusting, and balancing procedures, schedule and conduct a meeting with the Owner and representatives of installers of mechanical and control systems. Meeting objective is final coordination and verification of system operation and readiness for testing, adjusting, and balancing, and assigning testing responsibilities of each installer.
- B. Systems shall be complete and fully operational prior to beginning procedures. Insure all items such as thermometer wells, pressure test-cocks, access doors, etc., are installed to facilitate tests and adjustments.

- C. Put all heating, ventilating, and air conditioning systems and equipment into full operation and continue operation during testing and balancing.
- D. Before air balance work is started, check system for duct leakage, install a complete set of clean filters, check for correct fan rotation and equipment vibration, and check automatic dampers for proper operation. Set volume control dampers and outlets in wide open position. Ensure fire dampers are open and that return air paths are not obstructed.
- E. Prior to performing hydronic balance work; check system for plugged strainers, proper pump rotation, and proper control valve installation and operation. Check air vents at high points of systems to ensure all are installed and operating freely (automatic type) or bleed air completely (manual type); and verify proper flow meter and check valve installation and proper system pressure.
- F. All throttling devices and control valves shall be set open.
- G. Performing Testing, Adjusting, and Balancing:
 - 1. Cut insulation, ductwork, and piping for installation of test probes to minimum extent necessary to allow adequate performance of procedures.
 - 2. Patch insulation, ductwork, and housings, using materials identical to those removed.
 - 3. Reseal ducts and piping, and test for and repair leaks.
 - 4. Reseal insulation to re-establish integrity of the vapor barrier.
 - 5. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other permanent identification materials.
 - 6. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.
- H. Sequencing and Scheduling:
 - 1. Systems shall be fully operational before beginning procedures.
 - 2. Conduct tests in the presence of the Owner after providing two (2)-day notice before any test is to be conducted. Provide water and electricity required for tests. Determine that all dampers, registers, and valves are in a set or full open position.
- I. Balancing:
 - 1. Water Balance:
 - a. Balance water piping systems to produce water quantities within 5 percent of design flow rates for cooling water systems and within 10 percent of design flow rates for heating water systems.
 - b. Hydronic systems shall be proportionally balanced, ensuring the path to one terminal is fully open. Total system flow shall be adjusted at pump by restricting discharge balancing valve.
 - c. Indicate and record final position of balancing valves.
 - d. Primary-Secondary Flow Systems: Balance primary system crossover flow first, then balance secondary system.
 - e. Pumps:
 - 1) Verify pump impeller size and pump rotation.
 - 2) Measure flow.
 - 3) Measure inlet and outlet pressures.
 - 4) Measure motor full load amperage at design flow and shut-off condition.

- f. Heat Exchangers:
 - 1) Measure water flow through all circuits.
 - 2) Measure inlet and outlet water temperatures.
 - 3) Calculate capacity in btu-h.
 - 4) Check setting and operation of automatic temperature-control valves and pressure reducing valves.
 - 5) Record safety valve settings.
 - 6) Verify operation of steam traps.
 - g. Chillers:
 - 1) Balance water flow through each evaporator and condenser with all pumps operating. Do not exceed flow for maximum tube velocity recommended by chiller manufacturer. Perform tests and record data with each chiller operating at design conditions for:
 - a) Evaporator and condenser water entering and exiting temperatures, pressure drop, and water flow.
 - b) Evaporator and condenser refrigerant temperature and pressures.
 - c) Calculate capacity in tons.
 - 2) For air cooled chillers, verify condenser fan rotation and record fan data, including number of fans and entering and exiting air temperatures.
 - h. Heat Transfer:
 - 1) Measure entering and exiting water temperatures and pressures.
 - 2) Measure gas flow rate.
 - 3) Measure water flow.
 - 4) Calculate capacity in btu-h.
 - i. Water Coils:
 - 1) Measure entering and exiting water temperatures and pressures.
 - 2) Measure water flow rate.
 - 3) Measure entering and exiting dry, and wet, bulb air temperatures.
 - 4) Measure airflow. Measure air pressure drop. Calculate capacity in btuh.
2. Air Balance:
- a. Balance duct system to produce air quantities within 10 percent of indicated value.
 - b. Dampers: Adjust automatic damper linkages to provide air flow quantities shown. Check all automatic dampers in normal operation to verify proper operation. Verify return, relief air, and fresh air intake dampers operate as designed to produce desired room comfort.
 - c. Place all fans (supply, return, and exhaust) in operation. Load or restrict filters to increase pressure drop to 50% of span between initial pressure drop and final recommended pressure drop for setting final air flows for fans. Check the following:
 - 1) Motor amperage and voltage to guard against overload.
 - 2) Fan rotation.
 - 3) Operability of static pressure limit switch.
 - 4) Automatic dampers for proper position.
 - 5) Air and water resets operating to deliver required temperatures.
 - 6) Air leaks in casing and in safing around coils and filter frames.

- d. Traverse Main and Branch Ducts: Perform pitot traverses for fan total air flows including traverses for hot and cold decks, for each zone in multi-zone systems and for each floor. Mark locations of pitot traverses on reduced drawings in final report.
 - 1) Note temperature and barometric pressure. Corrections should be made for systems for elevation.
 - 2) After establishing total air being delivered, adjust fan speed to obtain design airflow. Check power and speed to see that motor power and critical fan speed have not been exceeded.
 - 3) Proportionally adjust branch dampers until each has proper air volume.
 - 4) With all dampers and registers in system open and with supply, return, and exhaust fans operating at design cfm or speed, set minimum outdoor and return air ratio.
 - 5) After minimum outside air damper has been set for proper percentage of outside air, take another traverse of mixture temperatures. Notify the Owner and note in balancing report if variation from average is more than 5 percent.
- e. Adjust system with mixing dampers positioned for minimum outside air.
- f. Balance terminal outlets in each control zone in proportion to each other. Use branch dampers for major adjusting and terminal dampers for trim or minor adjustment only.
- g. Balance constant volume reheat systems in one mode, namely design airflow.
- h. Balance constant volume dual duct systems at the boxes for full cooling and full heating air flows. Balance the fan with all the boxes on full cooling. Record the total fan supply with the boxes on full cooling.
- i. Balance VAV fans by placing a certain number of the VAV boxes in full cooling mode. This number shall be equal to the system diversity and shall include boxes that are at the end of the system, that are on duct branches with high static loss and serve critical areas. With the system in this mode the fan shall be sheaved to maintain the static pressure required to control the worst case VAV box.
- j. Once total design air has been balanced in branches and at outlets, verify and record the following:
 - 1) Fan motor amperage.
 - 2) Fan speed
 - 3) Fan cfm.
 - 4) Fan outlet velocity.
 - 5) External and total static pressure.
 - 6) Supply, return, mixed, and outside air temperatures.
 - 7) Percent outside air under minimum damper position.
 - 8) Static pressure across each component (intake, filters, coils, and mixing dampers).
 - 9) Take a final duct traverse.
- k. Final adjustments shall include, but not be limited to the following:
 - 1) Adjust RPM on belt drive fans. Include sheave and belt exchange to deliver air flow within limits of installed motor horsepower and mechanical stress limits of the fan. Determine limiting fan tip speed before increasing RPM. Final fan speed setting shall allow for filter loading and shall establish proper duct pressures for operation of zone cfm regulators.
 - 2) Adjust rpm on Direct Drive Fans:
 - a) For motors with speed taps, set fan speed on tap which most closely approaches design cfm. Report tap setting on equipment data sheet as high, medium, or low.

- b) For motors with speed control, set output of fan at design cfm by adjusting control. Ensure the fans restart after shut down. Increase setting as required for proper setting. Mark control to indicate final setting position.
- 3) Terminal Boxes:
 - a) For variable air volume (VAV), constant volume boxes, or dual duct boxes, set regulators to provide design minimum and maximum airflow rates. Adjust thermostat to assure proper damper operation.
 - b) For VAV, or constant volume boxes with reheat, set regulators to provide design minimum and maximum air flow rates. Check control sequence operation to assure proper sequencing.
 - c) Air flow performance of boxes for both primary and secondary balance settings shall be verified by flow measuring hood measurements at diffuser outlets.
- 3. Smoke Systems: Test smoke management systems per NFPA 92A.
- 4. Equipment Motors: Record the following information for every motor and include information with the appropriate equipment.
 - a. Motor horsepower and rpm.
 - b. Nameplate and measured voltage and amperage, each phase.
 - c. Motor Starters and Thermal Heaters: Check for correct sizing for proper motor protection on magnetic and manual starters.
- 5. Building Automation System: Coordinate with Section 15935. Inspect temperature control systems for proper sequence of operation and approximate calibration. Report any deficiencies. Include written certificate in balance report that temperature controls function properly.
 - a. Verify proper operation of devices. Verify that all controllers are calibrated and operational.
 - b. Check location of transmitters and controllers. Note adverse conditions that would affect control and suggest relocation as necessary to the Owner.
 - c. Note settings on controllers. Note discrepancies between set point for controller and actual measured variable.
 - d. Verify operation of all limiting controllers, positioners, and relays (e.g., high and low temperature thermostats, high and low differential pressure switches, etc.).
 - e. Activate controlled devices, checking for free travel and proper operation of stroke for dampers and valves. Verify and note normally open (NO) or normally closed (NC) operation.
 - f. Verify sequence of operation of controlled devices. Note line pressures and controlled device positions. Correlate to air or water flow measurements. Note speed of response to step change.
 - g. Confirm interaction of interlock and lockout systems.
- 6. Sound and Vibration Levels: Test and adjust mechanical systems for sound and vibration in accordance with instructions of referenced standards.
- 7. After deficiencies are corrected, retest the systems until acceptable values are obtained.
- 8. Permanently mark balancing devices spray paint indicating final position. Grease markers are not permitted.

J. Report:

- 1. Report Format: Standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Include information indicated on standard

- report forms prepared by AABC or NEBB for each respective item and system, and schematic diagrams for each system or piece of equipment to accompany each respective report form.
2. Report Contents: Provide following minimum information, forms, and data:

a. General Information and Summary:

- 1) Inside cover sheet to identify testing, adjusting, and balancing agency, contractor, and project name. Include contact names, addresses, and telephone numbers.
- 2) Certification sheet containing seal, address, telephone number, and signature of Certified Test and Balance Engineer.
- 3) Listing of instrumentation used for procedures along with proof of calibration.

b. Test Data: Report shall include the following data, in addition to certified field report readings taken during the balancing and testing operations. Include required or specified reading, first reading taken, and final balanced reading.

- 1) Air Handling Units and Fans: Air handling unit, fan and motor nameplate information, type, drive sheave information (as installed and changed), and final belt number and size. Entering and leaving air temperatures during cooling and heating periods.
- 2) Air Balance for Supply, Return, Relief, and Exhaust Systems:
 - a) Outlets, Inlets, Diffusers, Registers, and Grilles: Size, reading orifice size, velocity in fpm, supply/return air temperature and final balanced air quantity in cfm.
 - b) Terminal Boxes: Design and final minimum and maximum cfm settings including fan cfm on fan powered terminal boxes. Entering air temperatures and leaving air temperatures with each stage of heat active.
 - c) Ducts: Size, velocity in fpm, and air quantity in cfm.
- 4) Hydronic Balance:
 - a) Water coil size and manufacturer.
 - b) Boiler and burner nameplate information and flue gas analysis. Flue gas analysis shall be copy of manufacturer's analysis report.
 - c) Chiller and motor nameplate information.
 - d) Cooling tower and fan motor nameplate information.
 - e) Pump and motor nameplate information. Include manufacturer's pump curves.
 - f) Heat exchanger nameplate information.
- 4) Record thermal protection for all motors. Starter brand, model, enclosure type, installed thermal heaters and rating of heaters, required thermal heaters and rating of heaters if different from installed shall be recorded.
- 5) Include sheet that reports method of balance, project altitude, and any correction factors used in calculations.
- 6) Include a reduced set of contract drawings with all terminals (VAV boxes, outlets, inlets, coils, unit heaters, fans, etc.) clearly marked and all equipment designated.
- 7) Prepare list of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced and submit to Owner.

3.3 TESTING, CLEANING AND CERTIFICATION

- A. After cleaning, pressure tests, adjusting, and balancing are complete, each system shall be performance tested as a whole to verify that all items perform as integral parts of system, and temperatures and conditions are evenly controlled throughout building. Make corrections and adjustments as required to produce conditions indicated.

B. Provide four (4) copies of testing, adjusting, and balancing report bearing seal and signature of the TAB Engineer. The report shall be certification that systems have been tested, adjusted, and balanced in accordance with referenced standards; accurate representation of how systems have been installed; and accurate record of all final quantities measured.

C. Final Report:

1. Submit a preliminary report within thirty (30) days of completed TAB work. Report shall include the following information.
 - a. A general discussion preface section. This section shall summarize all abnormalities or problems encountered during the project and what course of action was taken. This summary should be assembled from the written progress reports described earlier, except that it will be expanded to include responses from the Engineer and Contractor regarding each problem indicated in the progress reports.
 - b. Copies of correspondence if related to the performance and balance of the systems.
 - c. Status of doors, windows and equipment static pressures during balance work.
 - d. Belt and sheave information, fan and motor nameplates information, full load operating voltage and amperage indicate sheave diameter as pitch diameter.
 - e. Design and final actual cfm at each system terminal unit. Include terminal/size, inlet static pressure, temperature and velocities read to attain the design cfm.
 - f. Overload protection for all motors shall be recorded. Starter and brand model, enclosure type, installed overload devices, original ratings, and set points (and revised device ratings and set points when application) shall be recorded.
2. Any corrective action shall be completed by the Mechanical Contractor and the systems re-tested. The corrected system information shall be provided in the final report.
3. Final Report shall be completed within twenty (20) business days of preliminary report.

END OF SECTION 15990

SECTION 16010 – ELECTRICAL GENERAL PROVISIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, General Conditions of the Contract for Construction apply to work of this Section and all subsequent Division 16 Sections.

1.2 WORK INCLUDED

- A. The work covered by this Division of the specifications consists of furnishing all material and labor, equipment and supplies, and performing all operations including cutting, channeling, chasing, excavating and backfilling necessary for the installation of complete wiring systems and electrical equipment, in accordance with this Division of the specifications and the accompanying drawings.
- B. Included are systems for lighting, power, connections to equipment furnished by others, telephone, fire alarm, and others as indicated.
- C. The work shall be coordinated with the work of other trades to insure correct location and installation of the building components and equipment required by all trades for electrical service.
- D. Prior to bidding the work, the Contractor shall examine all sections of the specifications and the complete set of Contract Documents and bring to the attention of the Architect and Engineer any omissions, conflicts, or concerns effecting this Division of the work.

1.3 DRAWINGS

- A. The drawings and specifications are complimentary to one another and what is called for by one shall be as binding as if called for by both.
- B. Drawings indicate generally the location of equipment and are to be followed as closely as possible. If due to job conditions it is found necessary to change the location of equipment, such changes shall be made without additional cost to the Owner and as approved by the Engineer.
- C. Verify final rough-in locations with field measurements and the requirements of the specific equipment to be connected.
- D. Refer to equipment specifications in all other sections for rough-in requirements.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

- A. Execute and inspect all work in accordance with Underwriters Laboratories (UL), and all local and state codes, rules and regulations applicable to the trade affected as a minimum. If the plans and/or specifications call for requirements that exceed these rules and regulations, the more stringent requirement shall be followed. Follow applicable sections and requirements and testing procedures of NFPA, IEEE, NEMA, CBM, ANSI, NECI, ICEA and NETA.
- B. The Contractor shall be responsible for the proper selection and application of materials and the methods of their installation. UL listed equipment shall be installed as specified in the latest edition of the "Electrical Construction Materials Directory."

1.5 PERMITS AND FEES

- A. The Contractor shall arrange for and pay for all inspections, licenses and certificates required in connection with the work.

1.6 TEMPORARY FACILITIES

- A. Light, Heat, Power, Etc.: Responsibility for providing temporary electricity, heat, and other facilities shall be as specified in Division 1.
- B. Building distribution equipment and devices may only be used with written permission from the Owner. If used for temporary power, the equipment shall be properly maintained and the Contractor shall repair any damage resulting from use. The guarantee period for new equipment shall not begin until the equipment is turned over to the Owner.

1.7 ACCESSIBILITY

- A. Install equipment and materials to provide required code clearances and access for servicing and maintenance. Coordinate the final locations with piping, ducts, and equipment of other trades to ensure proper access for all trades. Coordinate locations of concealed equipment, disconnect switches, and enclosure boxes with access panels and doors. Allow adequate space for removal of parts, fuses, lamps, etc. that require replacement or servicing.
- B. Extend all conduits such that junction boxes and pull boxes are in accessible locations.
- C. Install access panels or doors where equipment or boxes are concealed behind finished surfaces.

1.8 EXISTING CONDITIONS

- A. The Contractor shall visit job site and verify all conditions and dimensions. No extra payment shall be approved for unforeseen items.

1.9 SHOP DRAWINGS

- A. Before starting work, prepare and submit to the Engineer for review six sets of all major items of equipment, including distribution equipment, all lighting fixtures, fire alarm equipment, etc. A cover sheet shall be included, listing manufacturer and model number of each item submitted. Continue to submit for the Engineer's review until a REVIEWED or MAKE CORRECTIONS NOTED action is received.
- B. Recognize the purpose of shop drawings and other submittals is to inform the Engineer about equipment the Contractor proposes to furnish and install. Approved submittals are not change orders and do not give the Contractor authorization to deviate from the specification or the bid price for the project.

1.10 SUBSTITUTIONS AND APPROVALS

- A. Bids for work covered under this section of the specifications shall be based on the layout and equipment exactly as shown and specified. If the Contractor wishes to bid an alternate item, a request shall be submitted in writing in accordance with the General Conditions indicating such substitutions within the specified period prior to bid opening. Such requests shall be accompanied by sufficient catalog data upon which a decision may be based.
- B. The burden of proof that proposed equipment is equal or superior to that specified shall be on the Contractor. Substituted equipment shall only be allowed where specifically listed by written

addendum. If substitutions are not granted, the specified materials and equipment shall be installed. Where substituted equipment is allowed, it shall be the Contractor's responsibility to notify all related or affected trades of the accepted substitution and to assume full responsibility for any costs caused as a result of the substitution.

- C. Unless otherwise specified, all materials and equipment shall be of domestic (USA) manufacturer.

1.11 PRODUCT LISTINGS

- A. When two or more items of same material or equipment are required they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, sheet metal, steel bar stock, welding rods, solder, fasteners, and similar items used in work, except as otherwise indicated.
- B. Provide products that are compatible within systems and other connected items.

1.12 NAMEPLATE DATA

- A. Provide equipment having a permanently mounted, operational data nameplate indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliance, and similar essential data. Install equipment such that nameplate is readily accessible.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Division 1, sections on Transportation & Handling, and Storage & Protection.
- B. Deliver products to project site properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identification; adequately packaged and protected to prevent damage during shipment, storage, and handling.
- C. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage and weather.
- D. Coordinate deliveries of electrical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installation.

1.14 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installation that follow.
 - 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
2. Comply with requirements of Authorities Having Jurisdiction and of the utility company providing electrical power and other services.
3. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.

1.15 RECORD DOCUMENTS

- A. During construction, the Contractor shall make a record of all changes, in erasable pencil, made to the Contract Documents, including accurate dimensions, where applicable, and shall record accurate dimensions locating all below-grade outside electrical utilities with reference to permanent above grade objects. This set of documents shall remain on the job site and be updated weekly.
- B. Upon project completion, all changes noted in above shall be recorded neatly, with red ink, by the Contractor on an unused set of Contract Documents and submitted to the Architect. This project shall not be considered complete until the updated record documents have been received and reviewed by the Engineer. The reviewed Project Record Documents shall then be returned to the Architect.

1.16 OPERATION AND MAINTENANCE DATA

- A. Refer to Division 1, section on Project Closeout or Operation and Maintenance Data for procedures and requirements for preparation and submittal of maintenance manuals.
- B. In addition to the information required by Division 1 for Maintenance Data, include the following information:
 1. Description of function, normal operating characteristics and limitations, fuse curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
 2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shutdown, emergency instructions, and summer/winter operating instructions.
 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 4. Servicing instructions, lubrication charts and schedules.
 5. Complete list of parts and wiring diagrams.
 6. Name, address and telephone numbers of the Contractor, Sub-contractors and local company responsible for maintenance of each system or piece of equipment.
 7. All information shall be permanently bound in a 3-ring binder. The job name & address and Contractor's name & address shall be permanently placed on both the cover and spine of each binder. Dymo-tape is not acceptable.
 8. Copies of all test reports shall be included in the manuals.
- C. This contract will not be considered complete nor will final payment be made until all specified materials, including test reports, have been provided and the Architect/Engineer has reviewed the manual.

1.17 WARRANTIES

- A. Refer to Division 1, section on Warranties and Bonds for Procedures and Submittal Requirements for Warranties. Refer to individual equipment specifications for warranty requirements. In no case

shall the warranty for the total electrical system be less than one year from date of acceptance by the Owner.

- B. The Contractor shall furnish a written guarantee to the Owner covering a period of one year from the date of final acceptance of the installation. The guarantee shall cover materials and workmanship, and any omission or defects that may arise or be discovered during the period and shall be corrected in a manner that is acceptable to the Owner at no additional expense.
- C. Provide complete standard warranty information for each item. Information shall include product or equipment description, beginning date of warranty or bond; duration of warranty or bond; and names, addresses, telephone numbers and procedures for filing a claim and obtaining warranty services.
 - 1. Compile and assemble the warranties specified in Division 16 and include in Operation and Maintenance Manuals, tabulated and indexed for easy reference.
 - 2. Post the following warranty information on equipment: Length of warranty, installation date, Manufacturer's and Installer's contact information.

END OF SECTION 16010

SECTION 16015 – SEISMIC PROTECTION FOR ELECTRICAL CONDUIT AND EQUIPMENT

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Seismic protection measures specified herein are in addition to any other items included in other sections of these specifications.
- B. Electrical and equipment to be protected shall include the following items:
 - 1. Conduit (referred to herein as piping)
 - 2. Switchgear
 - 3. Panelboards
 - 4. Light Fixtures
 - 5. Transformers
 - 6. Disconnect Switches
 - 7. Contactors
 - 8. Control Panels
- C. This facility is located in Seismic Zone D.
- D. Seismic restraints may be omitted from electrical conduit less than 2 1/2-inches trade size. All other interior conduit shall be seismically protected as specified.

1.2 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designations only.
 - 1. American Society for Testing and Materials (ASTM) Standards:
 - a. A 307-84 Carbon Steel Externally Threaded Standard Fasteners
 - b. A 325-85 High-Strength Bolts for Structural Steel Joints
 - c. A 576-81 Steel Bars, Carbon, Hot-Wrought, Special Quality

1.3 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall conform to the respective specifications and other requirements specified below:
 - 1. Bolts and Nuts
 - a. Square head bolts and heavy hexagon nuts, ANSI A 307 or A 576.
 - b. Bolts, ASTM A 325.
- B. Sway brace details shall conform to all applicable requirements cited therein.
- C. Flexible couplings shall be those specified for the piping system covered by other sections of these specifications, provided they will maintain a tight flexible joint under all reasonable conditions or pipe displacements due to settling or shifting of the ground expected with seismic activity.

1.4 SWAY BRACES

A. Sway braces shall be installed on piping not otherwise rigidly anchored to preclude damage during seismic activity as follows:

1. All piping 1-1/2 inches and larger and located in equipment rooms.
2. All other piping 2-1/2 inches and larger.
3. Pipes suspended by individual hangers 12 inches or less in length from the top of pipe to the bottom of the structural support for the hanger do not require sway braces.
4. Provisions of this paragraph apply to all piping within a 5-foot line around outside of building unless buried in the ground. Piping grouped for support on trapeze type hangers will be braced at the same intervals as hereinafter provided for individual pipe runs, with details increased in cross sectional area proportionate to the increased weight per linear foot of pipe or conduit and contents supported at each trapeze hanger. No trapeze type hanger will be secured with less than two 1/2 inch bolts.

B. Sway Braces for Pipe:

1. Transverse sway bracing shall be provided at 30-foot intervals.
2. Longitudinal sway bracing shall be provided at 40-foot intervals.
3. Vertical runs of piping 2 inches and smaller, extending between floor levels or between floor and roof shall be braced at midpoint.
4. Bolts used for attachment of anchors to pipe and structure shall be not less than 1/2-inch in diameter.
5. Anchor rods, angles and bars shall conform to Table 1, depending on length, seismic zone, etc.

TABLE I

SIZE OF ANCHOR BRACES REQUIRED

Type Brace	Maximum Actual Length
Angles	
1-1/2 x 1-1/2 x 1/4"	4'-10"
2 x 2 x 1/4"	6'-6"
2-1/2 x 2-1/2 x 1/4"	7'-0"
2-1/2 x 2-1/2 x 1/4"	8'-2"
3 x 2-1/2 x 1/4"	8'-10"
3 x 3 x 1/4"	9'-10"
Rods	
3/4"	3'-1"
7/8"	3'-7"
Flat Bars	
1-1/2 x 1/4"	1'-2"
2 x 1/4"	1'-2"
2 x 3/8"	1'-9"
Pipe	
1" (Sch 40)	7'-0"
1-1/4" (Sch 40)	9'-0"
1-1/2" (Sch 40)	10'-4"
2" (Sch 40)	13'-1"

1.5 SPREADERS

- A. Spreaders shall be provided between racked or adjacent piping runs to prevent contact during seismic activity whenever pipe is less than 2 inches apart. Spreaders to be applied at same interval as sway braces.

1.6 FLEXIBLE COUPLINGS OR JOINTS

- A. Flexible couplings or joints in building piping shall be provided at bottom of all pipe risers 4-inch size and larger.
- B. Expansion deflection couplings shall be provided in all pipe 2" or greater at structure expansion and seismic joints.

1.7 ANCHOR BOLTS

- A. All floor or pad-mounted packaged equipment required by any section of these specifications shall use cast-in-place anchor bolts in accordance with Table II which are securely fastened through bases. Two nuts on each bolt will be provided. Anchor bolts shall have a straight embedment length equal to at least 10 times the nominal diameter of the bolt. Expansion anchor bolts in lieu of cast-in-place bolts shall not be allowed.

TABLE II

SCHEDULE FOR CAST-IN-PLACE ANCHOR BOLTS

Equipment Weight (lbs)	Operating	Anchor Bolt Diameter Size	Anchor Bolt	Quantity
1,000		3/8"		4
5,000		1/2"		4
10,000		5/8"		6
20,000		3/4"		6
30,000		1"		6
50,000		1-1/4"		6
100,000		1-1/2"		6

- B. Anchor bolts shall extend into concrete floor or the foundation and as applicable, the floor or foundation shall be increased in depth to accommodate bolt lengths. Coordinate with concrete installer.

END OF SECTION 16015

SECTION 16100 – BASIC MATERIALS AND METHODS

PART 1 – GENERAL

1.1 MATERIALS

- A. Except where noted otherwise, materials shall be new and as specified and shall not be substituted unless authority is obtained from the Architect or Engineer. All material shall be Underwriters approved and bear the UL label. The materials shall be standard products of an established manufacturing firm regularly engaged in the manufacture of such materials, and shall be the manufacturer's latest design unless distinctly specified to the contrary. All items of the same type shall be identical products of the same manufacturer.
- 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. Protection: Materials and equipment shall be delivered to the job in the manufacturer's standard cartons, packages, and bundles, and shall be labeled to show the manufacturer's name, product, etc., on each item. Materials such as fixtures, lamps, panelboards, etc., shall be stored within a weatherproof building or other approved enclosure. Conduit, underground wiring, and similar materials shall be stacked 8" above the ground. All materials shall be protected from damage due to traffic on and about the job prior to, during, and after installation within the building structures, until the final acceptance of the work. Damaged materials and equipment shall be promptly removed from the premises and replaced with acceptable materials and equipment, without cost to the Owner.

1.2 COORDINATION

- A. Coordinate size and location of concrete bases for floor mounted distribution equipment. Cast anchor-bolt inserts into bases.

PART 2 – PRODUCTS

2.1 RACEWAYS AND FITTINGS

- A. All conductors and cables shall be installed in raceways. Metal clad cables (Type MC) are not acceptable, except as whips to lighting fixtures and then not to exceed 6 feet in length.
- B. All raceways in solid masonry construction or in wet areas shall be rigid metal conduit, made from mild steel, hot-dipped galvanized pipe conforming to ANSI C80.1 and UL 6.
- C. All exposed raceways below 6 feet above finished floor and subject to severe physical damage shall be rigid galvanized steel conduit
- D. All raceways except as noted above shall be rigid metal conduit or electrical metallic tubing (EMT), which shall be galvanized steel conforming to ANSI C80.3 and UL 797.
- E. Conduit run in earth shall be plastic coated or shall be painted with two coats of asphaltic paint conforming to NEMA RN 1. Fittings for coated conduit shall be plastic coated or wrapped with two layers of vinyl electrical tape. Non-metallic conduit conforming to NEMA TC 2 is acceptable if a transition is made to the aforementioned protected metallic conduit where it leaves or enters the earth.

1. Underground, Concrete Encased: Type EB-20 RNC. Use a minimum of five feet of PVC coated rigid metal conduit at foundation penetrations.
 2. Underground, Not Concrete Encased: Schedule 40 PVC or Schedule 80 conduit. Use a minimum of five feet of PVC coated rigid metal conduit at foundation penetrations.
- F. All raceways for connection to vibrating equipment or freestanding equipment, including flow and tamper switches, transformers, and hydraulic, pneumatic, electric solenoid, or motor-driven equipment shall be flexible metal conduit (FMC) in dry locations in compliance with UL 1 and liquid-tight flexible metal conduit (LFMC) in damp and wet locations per UL 360.
- G. Surface metal raceways shall be furnished where indicated, and may be utilized in other areas upon specific approval of the Architect. Raceways shall be galvanized steel with snap-on covers. The cover shall be assembled to the base with a locking hinge. The base of the raceway shall have removable barriers to separate channels. The raceway and all components must comply with UL 94VO and be UL listed. Raceways shall be painted to match walls and/or bases, and colors shall be approved by the Architect. Raceways to be field-painted shall be furnished with a prime coat.
- H. Fittings:
1. Fittings for rigid conduit and EMT shall conform to ANSI C80.4. EMT fittings shall be interlocking, steel compression type, moisture proof. Terminal fittings shall have insulated throat.
 2. Fittings for flexible conduit shall be liquid-tight fittings as Ideal Vap-oil-tite Series 7500-500, O-Z Gedney Series 40, or Thomas & Betts Series 5300 and 6000, with insulated throats.

2.2 SUPPORTS

- A. Hangers shall be galvanized malleable iron one-hole type straps for single conduit and trapeze type for multiple conduits.

2.3 CONDUCTORS AND CABLES

- A. Building wires shall be thermoplastic insulated conductors per UL 83 and be manufactured to meet the standards of Insulated Cable Engineer's Association (ICEA).
- B. Branch circuit feeders whose length from panel to first outlet exceeds 100 feet for 120 volt circuits or 220 feet for 277 volt circuit shall be No. 10 or larger, as required by NEC.
- C. No. 10 AWG and smaller branch circuits shall be solid conductor, Type THWN, THW or TW, except for motor circuits.
- D. No. 8 AWG and larger branch circuits shall be stranded conductor, Type THWN or THW.
- E. Underground service entrance and underground feeders shall be 75 degree C, Type USE-RHH-RHW-THW-THWN insulation.
- F. Fixture wire shall have a maximum operating temperature of 150 degree C at 600 volts nominal: Type AF insulation for 120 volt or Type SF-2 insulation for 277 volt.
- G. All conductors shall be sized on the basis of the UL rated temperature ampacity for the equipment or device to which they are connected.
- H. All conductors shall be copper. No conductor smaller than No. 12 AWG shall be installed unless otherwise noted.

- I. Conductor connectors shall be the spliced type for No. 10 and smaller wire and shall be made with approved solderless device such as wing nut connectors as made by Ideal Industries. Spliced connections for wires No. 8 and larger shall be made with approved solderless compression-type connectors and insulation tape per UL 510.

2.4 OUTLET BOXES

- A. Boxes, extensions and rings shall be sheradized or galvanized, shall comply with UL 514, and shall be of the depth necessary to finish flush with the wall or ceiling surface. Boxes shall be code gage sheet steel at interior dry locations and cast metal with gasketed cover at damp or wet locations. Provide a grounding terminal in the interior of the box when wiring to an item that includes a grounding conductor.
- B. All boxes shall be sized in strict accordance with the National Electrical Code (NEC), Article No. 314, except that no box will be less than the minimum specified.
- C. Wall boxes for switches and receptacles shall not be less than 1-1/2 inches deep and of one piece construction, unless noted otherwise. Boxes shall be arranged with knockouts of the size required to receive the raceway fittings.
- D. Boxes shall have lugs or ears to secure covers or plaster rings.
- E. Ceiling boxes shall be 4 inches square x 1-1/2 inches minimum or 4 inches octagonal x 1-1/2 inches minimum.
- F. Boxes for lighting fixtures shall have studs where required by fixture design.
- G. Boxes shall be ganged where two or more devices occur at same location.
- H. For boxes in main feeder conduit runs, use sizes not smaller than 8-inches square by 4-inches deep. Do not exceed six entering and six exiting raceways in a single box.

2.5 RECESSED FLOOR BOXES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Thomas & Betts, Hubbell, FSR, Inc. & Wiremold.
- B. Slab on Grade: Cast metal, fully adjustable, rectangular. Copper-free aluminum, unless otherwise noted, with integral threaded raceway entrances, and features and accessories suitable for each location including mounting ears and threaded screw holes for devices and closure plugs. Use standard depth boxes to permit side conduit entrance without interfering with reinforcing, but do not use boxes with more than 6-inch depth where slab depth will allow. Types, shape, sizes, and depth as indicated or required for each application. Use stainless steel screws and hardware. Boxes shall be ganged where two or more devices occur at same location. Provide low voltage barriers between ganged boxes when required. Provide as specified below, unless otherwise specified elsewhere or shown on the drawings.
 - 1. One, Two and Three-Gang Floor Box: Thomas & Betts, Steel City 640 Series flush floor box with P64-CP brass carpet flange and device cover plates. P64-DS (duplex receptacle), P64-GFCI (GFCI duplex receptacle or communication outlet).
 - 2. Multiservice Floor Box: Wiremold RFB Series. Cover shall be flanged, die-cast aluminum assembly, brass color. Lid area to be flush with the finished floor, no cutouts provided. Provide with required device inserts and cover plates.

- C. Above grade floor boxes shall be stamped steel.

2.6 WIRING DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Cooper, Watt Stopper, Hubbell, Leviton, Lutron, and Pass & Seymour.
- B. Snap switches shall be commercial specification grade, AC quiet type, grounding (screw) type, back- or side-wired, rated at 20 amperes at 125/277V AC with toggle handle, as specified below, unless otherwise specified elsewhere or shown on the drawings:
- Cooper CS120 – single-pole.
 - Cooper CS320 – three-way.
 - Cooper CS420 – four-way.
- C. Dimmer switches shall be commercial specification grade with on/off toggle handle and slider. Fluorescent dimmer switches shall be compatible with dimming ballasts. Switches shall be as specified below, unless otherwise specified elsewhere or shown on the drawings:
- Pass & Seymour CD703P, CD1103P, CD1603P & CD2003P – 700, 1100, 1600 & 2000-watt incandescent dimmers respectively.
 - Pass & Seymour CD3FB163P – 120V, 16A, 3-wire fluorescent dimmer.
 - Pass & Seymour CD3FB103P277 – 277V, 10A, 3-wire fluorescent dimmer.
- D. Automatic switches (occupancy sensor) shall be commercial specification grade, dual technology, 180-degree coverage, line voltage, light level sensor, walk-through mode with manual override button(s) and choice of Auto-On or Manual-On operation. Switches shall be as specified below, unless otherwise specified elsewhere or shown on the drawings:
- Watt Stopper DW-100 or SensorWorx equivalent – single relay.
 - Watt Stopper DW-103 or SensorWorx equivalent – single relay, multi-way.
 - Watt Stopper DW-200 or SensorWorx equivalent – dual relay.
 - Watt Stopper DW-203 or SensorWorx equivalent – dual relay, multi-way.
 - Watt Stopper TS-400 – digital timer (Time-out adjustment set to 15 minutes).
- E. Ceiling mounted occupancy sensor shall be commercial specification grade, dual technology, 360-degree coverage, line voltage, light level sensor, walk-through mode and choice of Auto-On or Manual-On operation. Sensor shall be as specified below, unless otherwise specified elsewhere or shown on the drawings:
- Watt Stopper DT-355 or SensorWorx equivalent.
- F. Where shown near doors, wall switches shall be mounted not less than 2 inches nor more than 12 inches from trim, except where double doors are shown install switches 2 to 12 inches beyond door swing.
- G. Duplex receptacles shall be commercial specification grade, straight blade, back- or side-wired, rated 20 amperes at 125 volts, NEMA 5-20R, as specified below, unless otherwise specified elsewhere or shown on the drawings:
- Cooper BR20 – duplex receptacle.
 - Cooper VGF20 – GFCI duplex receptacle, non-feed-through type.
 - Cooper 1210 – TVSS duplex receptacle, integral. Cooper 1209 – Provide six spare replacement modules.

- H. Weatherproof duplex receptacles shall consist of a grounding type duplex receptacle, as specified above, with GFCI feature installed in Appleton or Crouse-Hinds type FS cast box with weatherproof cover and gasket or equal combination, unless otherwise specified elsewhere or shown on the drawings.
- Cooper 966 – wet location, self-closing lid.
- I. Where weatherproof outlets may be utilized continuously or are in “wet” locations, shall conform to the requirements for weatherproof receptacles and shall be installed with a hinged outlet cover/enclosure clearly marked “Suitable For Wet Locations While In Use” and “UL Listed.” There must be a gasket between the enclosure and the mounting surface, and between the hinged cover mounting plate/base to assure proper seal, unless otherwise specified elsewhere or shown on the drawings.
- Cooper WIU-1 – while-in-use cover.
- J. Special receptacles shall be as shown on the drawings. Single outlets shall be Cooper, Hubbell, Bryant, Leviton or equal of voltage and ampere rating indicated by NEMA configuration.
- K. Finish: Wiring devices shall be colors indicated below unless otherwise indicated or required by NFPA 70.

<u>System or Type</u>	<u>Color</u>
Normal Power System	White or as selected by Architect
Emergency Power System:	Red
TVSS Devices:	Blue
Isolated Ground Receptacles:	Orange
Specific-Use Device:	Black

- L. Wiring Device Cover Plates:
1. Plates for switches and receptacles shall be ganged where indicated at same location.
 2. All device boxes installed for future wiring shall have blank plates.
 3. **Cover plates shall be oversize / jumbo-size, single and combination type to match corresponding devices, brushed aluminum or brushed stainless steel with matching material screws or as selected by Architect.**
 4. Cover plates for exterior receptacles in damp or wet locations shall comply with NEC Article No. 406.8 and 20 ampere 120 volt receptacles shall be UL listed with plug cap inserted in receptacle.

2.7 DISTRIBUTION EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Square D.
- B. Furnish and install circuit breaker panelboards as indicated in the panelboard schedule and where shown on the plans. Panelboards shall be cabinet enclosures, dead front safety type with hard-drawn copper, 98% conductivity phase and ground bus and equipped with thermal-magnetic molded case circuit breakers of frame and trip ratings as shown on the schedule. Panelboards shall conform to UL 67 and UL 50.
- C. All panel boards, switches, fuses and circuit breakers shall be capable of withstanding and/or interrupting the short circuit current available at the device’s terminals. The contractor shall contact

the supplying utility for the exact available short circuit current. Initial estimates are on the drawings, or the following approximate values can be used for estimating purposes.

<u>Three Phase Service Capacity</u>	<u>A.I.C.* @ 208Volt-3Phase</u>	<u>A.I.C.* @ 480Volt-3Phase</u>
< 600 Amps	(20) x (Service Cap.)**	10,000 Amps
600 – 800 Amps	(20) x (Service Cap.)**	20,000 Amps
801 – 2000 Amps	(20) x (Service Cap.)**	25,000 Amps
> 2000 Amps	(20) x (Service Cap.)**	(10) x (Service Cap.)**
* A. I. C. is the Amperes Interrupting Capacity in Amps, RMS, Symmetrical.		
** For a 208-Volt 3-Phase service with 600-Amp capacity, the A.I.C. would be (600 X 20 = 12,000) 12,000 Amps, RMS, Symmetrical.		

- D. Circuit breakers shall be quick-make, quick-break, thermal-magnetic trip indicating, and have common trip on all multi-pole breakers. Trip indication shall be clearly shown by the breaker handle taking a position between ON and OFF position when the breaker is tripped. Branch circuit breakers feeding convenience outlets shall have sensitive instantaneous trip setting of not more than 10 times the trip rating of the breaker in order to give "flash protection" for frayed stranded wire cords. All connections to the bus shall be bolted.
- E. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type. Three phase, 4-wire panelboard bussing shall be such that any two adjacent single-pole breakers are connected to different polarities and in such a manner that 2-pole and 3-pole breakers can be installed in any location. Similarly, 1-pole and 2-pole breakers can be installed in any location in single phase, 3-wire panelboards and load centers. Each panelboard shall have an insulated neutral bus and appropriate connectors for feeder and branch circuits. Each panelboard shall have a separate equipment grounding bus with appropriate connectors/terminals for all feeders and branch circuits. The equipment ground bus shall be bonded to the neutral bus only at the main service disconnect. The cabinet shall be bonded to the equipment ground bus with the conductor sized per Table 250.122 of the NEC. Service main ratings shall be as shown in the panelboard schedule on the drawings.
- F. Panelboard terminals for main and branch circuit wiring, both breaker and neutral, shall be UL listed as suitable for the type of conductor specified.
- G. Panelboard circuit breaker position numbering shall be such that starting at the top, odd numbers shall be used in sequence down the left-hand side and even numbers shall be used in sequence down the right-hand side.
- H. The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gage of steel shall be in accordance with NEMA PB1 and UL 67 for panelboards. The enclosure shall be fabricated from galvanized steel or equivalent rust resistant steel. Fronts shall include door and have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. Fronts shall have adjustable indicating trim clamps which shall be completely concealed when the doors are closed. Doors shall be mounted by completely concealed steel hinges. Fronts shall not be removable with door in the locked position. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. The directory card shall provide a sufficient space for each circuit. The directory shall be typed to identify the load fed by each circuit and shall reflect all revisions that may have occurred during construction.
- I. Molded case circuit breakers shall comply with NEMA AB1. Circuit breaker types shall be UL listed and rated for the load being fed.

1. HACR: Air conditioning equipment.
2. Arc Fault Circuit Interrupting (AFCI): Lighting and power circuits in bedrooms.
3. HID: Fluorescent and high intensity discharge light being switched at the circuit breaker.

2.8 SAFETY SWITCHES

- A. Manufacturers: Shall be of same manufacturer as Distribution Equipment.
- B. Safety switches shall be fully enclosed, general duty, 240 or 600 volt, as indicated. Enclosure shall be metallic, general purpose for interior locations and rain-tight, NEMA 3R, with rain-tight hubs for exterior locations. Provide solid insulated neutral bus where required by the equipment. All switches shall include an equipment ground lug. Switches shall be non-fused, unless otherwise indicated. Fused switches, where indicated on drawings, shall be fitted with dual element, time delay, non-renewable fuses. Provide a spare set of fuses for each fused switch.

2.9 SURGE PROTECTION DEVICES (SPD)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Advanced Protection Technology, Current Technology, Liebert Corporation, or Thor Systems, Inc.
- B. Standards: UL 1449, 1283, ANSI/IEEE C62.41.1-2002, C62.41.2-2002, C62.45-2002, NEC Article 285.
- C. Type 2, plug-in style (field replaceable per-phase modules), solid state, parallel-connected, sine-wave tracking suppression and filtering modules in a NEMA 12 enclosure.

1. Minimum Single-Impulse Current Ratings:

<u>SPD Location</u>	<u>Per Mode</u>	<u>Per Phase</u>	<u>Per System</u>
Service Entrance (Load Side)	120	240	360

2. UL 1283 EMI/RFI filtering with minimum attenuation of -50dB at 100kHz.
3. Short Circuit Current Rating (SCCR) of 200kA.
4. Protection modes shall be Line to Neutral, Line to Ground, & Neutral to Ground.
5. UL 1449 Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

<u>System Voltage</u>	<u>L-N</u>	<u>L-G</u>	<u>N-G</u>	<u>MCOV</u>
120/240 Split Phase: 2W+N+G	700	700	700	150
120/208 Three Phase WYE: 3W+N+G	700	700	700	150
277/480 Three Phase WYE: 3W+N+G	1200	1200	1200	320

6. Accessories:

- a. Form-C contacts, one normally open and one normally closed, for remote monitoring of system operation. Contacts to reverse position on failure of any surge diversion module.
- b. Audible alarm activated on failure of any surge diversion module.
- c. Warranty: Manufacture's standard form in which manufacturer agrees to repair or replace components of SPD and associated auxiliary components that fail in materials or workmanship within five years from date of Substantial Completion.

2.10 LIGHT FIXTURES

- A. Light fixtures shall conform to the UL Standard for light fixtures, Publication No. 57, and shall be complete with lamps, lens, diffusers, canopies, and all necessary accessories, fittings, and mounting hardware. Light fixtures shall be surface-mounted, semi-recessed, or recessed type as indicated in the fixture schedule and shall be furnished with hangers, plaster rings, or other devices for a neatly finished installation. All fixtures shall be factory wired and assembled. The Contractor shall be responsible for ordering fixtures designed for installation with the ceiling indicated for the various spaces. Recessed fixtures in fire-rated assemblies shall be provided in compliance with the respective UL design assembly regulations.
- B. Incandescent fixtures shall not be permitted, unless otherwise indicated.
- C. Light fixtures shall have a minimum five(5) year warranty on the fixture.
- D. LED Fixtures: Comply with UL listings and shall be DLC listed.
- E. Refer to drawings for Light Fixture Schedule.

2.11 LIGHTING CONTROL PANEL – Not Applicable

2.12 GROUNDING

- A. Grounding will be required for all feeders and branch circuits using green insulated ground conductor run with the hot and neutral conductors. Size equipment ground wires per Table 250.122 of the NEC. Bond motors and all non-current carrying metallic parts of electrical equipment, devices, light fixtures, raceways, etc. per the NEC.
- B. Grounding rods shall be a minimum of 3/4 inch in diameter x 10 feet long, sectional type, of copper clad steel with a copper wall thickness of not less than 0.013 inch. Connectors shall be solid copper or brass U-bolt clamps.
- C. Intersystem bonding termination shall be provided and shall include provisions for connecting at least three grounding or bonding conductors required for communications systems with a minimum 6 AWG copper conductor.
- D. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches in cross section, unless otherwise indicated; with insulators. Provide where indicated on drawings.
- E. Connectors: Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

2.13 FIRESTOPPING

- A. All conduits which pass through fire-rated assemblies, or are run inside fire-rated walls, floors or ceiling, shall be firestopped on both sides of the penetration in accordance with UL 1479 and ASTM E 814.
- B. Firestopping materials shall be as manufactured by 3M Company, CP-25 caulk, moldable putty, FS-195 strips, and CS-195 sheets, or equal by Dow-Corning.

PART 3 – EXECUTION

3.1 GENERAL

- A. All work shall conform to the best recognized practices of the trade, employing the latest accepted techniques and using modern tools and equipment in accordance with requirements of safety rules and regulations. The work shall be performed by competent workmen, skillful and experienced in the particular type of work to be performed, and under the supervision of a competent and experienced foreman. Only qualified electricians shall be used for installation and wiring of panelboards, control devices, motors, and equipment. The Electrical Contractor shall consult with the General Contractor and other trades as necessary to determine exact requirements for installation of the equipment required by other trades. Before work commences, a coordination drawing shall be created which shall be reviewed with the construction superintendent to eliminate interference with building components and insure proper location of the various electrical devices. The location of outlet boxes shall be double checked with the construction superintendent immediately prior to placing concrete and wallboard.

3.2 RACEWAYS AND FITTINGS

- A. All raceways shall be concealed in walls or ceiling unless otherwise noted. No conduit shall be less than 1/2 inch in size. Generally, the conduit runs shall be parallel with, or at right angles to, the building walls, beams, and joists. Bends and offsets in conduit shall be smoothly made using an appropriate bending tool. Offsets and bends in each run of conduit shall be kept to the minimum that will permit installation. Where excessive bends are required, the size of the conduit will be larger in accordance with requirements of the NEC. Conduit shall be supported using strap hangers, beam clamps, or other approved devices to prevent vibration and excessive sagging between the supports. In slabs, conduits shall be installed at least 1-1/2 inches below top of floor. Vertical runs of conduit shall be securely supported with clamps or other devices at the lower end of each vertical run. Such supports shall be adequate to support the weight of the conduit and enclosed conductors. Fittings for all conduit shall be made mechanically tight for electrical continuity through the entire installation. Terminal fittings at panelboards and outlet boxes shall have plastic throat bushings. Provide temporary plugs in open ends of all conduit during the construction period to prevent entrance of foreign matter. Clean inside of raceways before installing conductors.
- B. 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.
- C. Ream raceways and butt ends into couplings; all threaded joints shall be made tight. Install raceways with no more than four quarter-bends per run maximum. Install no pull box in an inaccessible location. Fasten raceway to boxes with locknuts and bushings. Wherever threads are left exposed or where protective coatings have been removed during installation, provide two coats of galvanize-coating paint.
- D. Tables in Appendix C of latest NEC shall apply unless larger raceway specified.
- E. EMT shall be secured for grounding purposes by means of concrete-tight connections of the interlocking compression ring, or stainless steel multiple joint locking ring type. Set screws or indentation fittings shall not be acceptable. EMT 3/4 inch or larger shall be provided with insulated connectors.
- F. Flexible type conduit shall be used for a pigtail type connection between the rigidly mounted terminal outlet box and each lay-in light fixture and the final connection to vibrating equipment and freestanding equipment, including flow and tamper switches, transformers, and hydraulic, pneumatic, electric solenoid, or motor-driven equipment. Flexible conduit for outdoor equipment

shall be liquid-tight type using moisture-proof fittings. Conduit length shall be no more than 36 inches. Install separate ground connector across flexible connections.

- G. Surface mounted conduit shall be painted to match walls with paint acceptable to Architect.
- H. Conduit passing through concrete walls shall be fire-sealed.
- I. Sleeves: Install in concrete slabs and walls and all other fire-rated floors and walls for raceways and cable installations as required:
 - 1. Where sleeves through floors are installed, extend above finish floor.
 - 2. Where individual conduits penetrate fire-rated walls and floors, provide pipe sleeve one size larger than conduit; pack void around conduit with fire rated insulation and seal opening around conduit with UL-listed firestopping sealant. Conduits on trapeze type support system shall require fire taping only. See Architectural plans for location and extent of fire rated assemblies.
 - 3. Where conduits are to be installed through structural framing members, the contractor shall provide sleeves. For areas where sleeves have not been provided, the Architect's written approval must be obtained prior to cutting, notching or drilling of structural framing members.
- J. Emergency Circuits: Shall be run completely in metal conduit and be in a separate raceway system, isolated from non-emergency circuits.

3.3 CONDUCTORS AND CABLES

- A. Conductors shall not be installed in the raceway until the building is closed-in and dry. Before installation, the raceway shall be examined and all dirt and debris shall be removed by the use of swabs, vacuum cleaner, blower, or other devices. Conductors shall not be installed in conduit that has moisture accumulation. Special care shall be exercised during the 'pulling' of the conductors in raceway system to prevent damage to the conductor insulation. Lubricant shall be of a type that will not cause deterioration of the raceway or the conductor insulation. Conductors shall be a minimum of No. 12 AWG. Conductors run in vertical raceways shall be supported per NEC Article No. 300.19.
- B. Conductors for branch lighting and appliance circuits shall be run as single phase, 2-wire, 120 volt service except that a common neutral may be used for 2 or 3 circuits when each circuit is on a different phase (increase neutral by one size if non-linear load is on two or more circuits). A separate neutral will be required in all other cases.
- C. Splices shall be made only in accessible outlet or junction boxes.
- D. Conductor connections shall be made tight with screws set home to prevent loosening. Use insulated wire nuts for taps and splices in No. 10 and No. 12 gage wires. Split bolt connectors shall be used on No. 8 and larger size conductors. Uninsulated splice devices shall be covered with not less than 3 layers of rubber tape, and additionally with friction or plastic tape.
- E. Conductors at each outlet device shall have 8 inches long terminal leads to facilitate wiring device installation and shall be neatly curled into the box before installation of the device and cover. Conductors within panelboards and other equipment shall be neatly run to permit ease in tracing. Random type bird nest wiring will not be permitted.
- F. Wire markers shall be used to mark wires within panelboards corresponding to the circuit number and within outlet boxes where the same color is repeated for two or more circuits. Wire markers shall be Brady E-Z code or an approved equal.
- G. Conductors shall be color coded as follows:

277/480V., 3 PH.

Phase A - Brown
Phase B - Orange
Phase C - Yellow
Neutral - Gray
Ground - Green

120/208V., 3 PH.

Phase A - Black
Phase B - Red
Phase C - Blue
Neutral - White
Ground - Green

120/240V., 1 PH.

Phase A - Black
Phase B - Red
Neutral - White
Ground - Green

3.4 OUTLET BOXES

- A. Outlet boxes shall be provided for all light fixtures, wiring devices, and equipment connections. Boxes shall be of size and type to properly accommodate the size and number of raceways entering the box and conductors.
- B. Attachment devices for outlet boxes shall be nails for wood construction and bolts, clamps or powder-actuated studs for masonry or light steel construction. Install in such a manner that will not cause structural damage to the structural members. Welding of boxes and conduit will not be permitted.
- C. Boxes for ceiling mounted light fixtures shall be securely mounted to the building structural members. Where light fixtures are to be supported directly from the outlet box, the box anchorage shall be sufficiently rigid and strong to prevent movement of the box and fixture in the completed structure.
- D. Outlet boxes for surface-mounted light fixtures shall be set so that the face of the outlet box is flush with the finished ceiling or wall surfaces as applicable.
- E. Outlet boxes for lay-in light fixtures shall be mounted to the nearest structural member above the fixture location with fixture connection made using flexible conduit from outlet box to the light fixture.
- F. Outlet boxes in metal stud partitions shall be installed on bar hangers rigidly fastened to at least two studs.
- G. Outlet boxes for wall switches shall be mounted on the strike edge of the door, 48" above the floor. Where more than one switch is indicated as side-by-side, the box shall be of size to permit gang-mounting of all switches within a single box.
- H. Outlet boxes for wall switches shall be mounted on the strike edge of the door, 48" above the floor to center of box. Where more than one switch is indicated as side-by-side, the box shall be of size to permit gang-mounting of all switches within a single box.
- I. In cases where the finished wall is masonry construction, rough-in heights may be adjusted to suit the block course; outlets should occur at the top or bottom of the masonry units.
- J. Back to back outlet boxes are not permitted. Separate boxes a minimum of 6 inches in standard walls and 24 inches in acoustical walls.
- K. Cap unused knockout holes where blanks have been removed and plug unused conduit hubs.
- L. Protect outlet boxes to prevent entrance of plaster, and debris during construction. Thoroughly clean foreign material from boxes before conductors are installed.

3.5 WIRING DEVICES

- A. Install wall switches so that the load is off when the toggle is in the down position. Gang switches under common plate where two or more indicated at same locations. Mount switches at 48 inches above finished floor to center of the junction box.
- B. Install duplex receptacles in the vertical direction with the grounding terminal [down][up], except where specifically otherwise indicated. Above counter duplex receptacles shall be mounted horizontally with the grounding terminal on the [left][right].
- C. Special outlets shall be installed to suit the equipment served. Verify electrical requirements with the respective equipment manufacturer's approved shop drawings and coordinate with the installing contractor.
- D. Provide plaster rings when necessary to install cover plates flush with finished wall or ceiling surfaces.
- E. Locate automatic switches (occupancy sensors) per manufacturer's recommendations for proper operation and where there are no obstructions within coverage area. Coordinate with final furniture layout.
- F. When there are multiple occupancy sensors (wall and/or ceiling) within a single room, connect so that when one sensor is activated the entire space will illuminate unless otherwise indicated on the drawings.

3.6 DISTRIBUTION EQUIPMENT

- A. Distribution equipment shall consist of power and lighting panelboards, safety switches, raceway, conductors, etc., as indicated on the drawings and as specified herein. Cabinets and other enclosures shall be anchored to the building structure. The entire installation shall be designed and installed to safely support the weight of the equipment, and shall be installed in a manner that will not damage the structure or interfere with the installation of the various electrical devices and equipment. Splice boxes shall be fitted with removable covers and shall conform to the requirements of the NEC for the task intended. All boxes and cabinets shall be neatly and accurately drilled, or punched, to receive the raceway fittings.
- B. Before installation of the electrical panels, the systems shall be planned and the exact location determined to eliminate interference with other building components. Panelboards shall be erected so that the top is not more than 7 feet 8 inches above the floor and with a minimum bottom clearance of 6 inches above the finished floor. Surface or recess mount as indicated on the drawings. Where wall thickness indicated on the drawings will not permit installation of the cabinet depth, the Architect shall be consulted for instructions. Surface mounted cabinets and switches shall be installed to permit opening of the doors and free and easy access to switch handles and other adjacent devices. Exposed conduit for panel feeders and branch circuits shall be arranged to obtain a neat installation and to permit finishing of the wall and ceiling surfaces in a workmanlike manner.
 - 1. Recessed mounted cabinets, provide a 1 inch spare conduit with pull string stubbed to above the accessible ceiling for every three spares or spaces.
- C. Label the front of each panelboard and switch to conform to the riser diagram or as specified. Label shall consist of an engraved plate punched or drilled for mechanical fasteners attached to the panel front. Letters shall be not less than 1" in height and of a contrasting color.
 - 1. Engraved legend with black letters on white face for normal.

2. Engraved legend with white letters on red face for emergency.
 3. Engraved legend with white letters on green face for ground connections.
- D. Balance loads to within 10 percent on all phase buses in the distribution equipment.
 - E. A sign stating DANGER ARC FLASH HAZARD in 3/4-inch high letters shall be permanently affixed to the front panel of all panelboards in accordance with NEC Article No. 110.16.
 - F. The contractor shall verify power and circuit breaker requirements for mechanical equipment with the Mechanical Contractor prior to ordering distribution equipment and conduit and conductor rough-in. Report major discrepancies to the Engineer.
 - G. Install floor-mounted distribution equipment on concrete bases.

3.7 SURGE PROTECTION DEVICES

- A. Install the SPD device directly above the protected equipment, where space permits, or as close as possible to the protected equipment. Conductor lengths shall be kept to a maximum of 18-inches or less.
- B. Provide overcurrent protection, sized as recommended by the manufacturer, from the main distribution panel.

3.8 LIGHT FIXTURES

- A. Light fixtures shall be installed per NEC Article No. 410, and as shown on the electrical drawings. Architectural reflected ceiling plans shall govern upon any light fixture location discrepancies.
- B. The Contractor shall consult with the Mechanical Contractor before installation of the duct work and the electrical work to eliminate conflicts between the two trades. Electrical fixtures shall not be relocated except when specifically approved by the Architect.
- C. Recessed light fixtures shall be installed flush, snugly fitted to the wall and ceiling surfaces, and shall be securely anchored in place with their weight independent of the ceiling. Lay-in light fixtures shall be suspended at all four corners from building structure using 12-gage galvanized steel wire. Light fixtures shall also be attached to ceiling grid with approved attachment clips. Diffusers and hinged frames shall be free from vibration.
- D. All fixtures shall be placed in operation complete (with lamps) before final acceptance.
- E. This Contractor shall provide support structure of Unistrut or Kindorf as required or shall support fixtures from building structural system with approved beam clamps or other devices.

3.9 LIGHTING CONTROL PANEL – Not Applicable

3.10 EQUIPMENT CONNECTIONS

- A. The Contractor shall be required to make connections to equipment furnished and installed by other trades as indicated on the drawings. The Contractor shall furnish electrical service, including conductor and conduit, from panelboards to the equipment, terminating in an outlet box located adjacent to the equipment and securely anchored to the building structure. Final connection between the outlet box and the equipment shall be made using flexible conduit from the outlet to the junction box on the equipment. Motor starters or other type of control equipment furnished with equipment provided by other trades shall be installed and connected by the Contractor; connect power wiring to all equipment. The Contractor shall be responsible for actual

wire connections at one point on packaged equipment only. Testing of the equipment shall be the responsibility of the installing trade. Where indicated, disconnect switches, fused or non-fused, shall be installed adjacent to the equipment location. Electrical equipment specified as a part of this section or furnished by other trades shall be completely installed and tested by the Contractor.

- B. The Contractor shall verify all Food Service Equipment power and receptacle requirements by reviewing cut sheets provided by the Owner/Contractor before rough-in. The Electrical Contractor shall also confirm power and receptacle requirements for medical or other equipment with the Contractor supplying that equipment prior to installation.

3.11 GROUNDING

- A. Grounding shall be as hereinbefore specified. Except where specifically indicated to the contrary, all exposed non-current carrying metal parts of electrical equipment, raceway system, and neutral conductor shall be grounded. Install grounding type bushing with jumper cables to panelboards and feeder raceway. Provide an equipment grounding conductor in all feeders and branch circuits sized per NEC Table 250.122. Flexible raceway shall have a green color grounding conductor run with the electrical phase conductors. Each item of prefabricated equipment and each electrical motor shall be grounded with a green colored conductor connected to the grounding lug of the outlet box and to the grounding pole of the receptacles. Bond panelboards to incoming and outgoing feeder raceways with grounding-type bushings with jumper cable per NEC.
- B. Intersystem bonding termination means shall be installed at one of the following specific locations per NEC Article No. 250.94:
 - 1. Meter socket enclosure.
 - 2. Service equipment enclosure.
 - 3. Grounding electrode conductor.

3.12 FIRESTOPPING

- A. Firestopping materials shall be applied per manufacturer's written instructions.
- B. Identification: Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. 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.

3.13 COMPLETION

- A. Final Adjustment: Final adjustment shall be made prior to the final inspection. The entire electrical system shall be checked and all defective lamps, switches, receptacles, and other items

of equipment shall be replaced. Cover plates and lighting fixtures shall be checked and aligned. All panels shall be clearly labeled and the directory in each distribution panel shall be neatly typed to show the use of each circuit.

- B. Tests: Following completion of all wiring installations, test each system and eliminate any grounding of potential conductors, short circuits and other faults. Test all receptacles with a test instrument which tests for properly-wired phase, neutral, and ground connections. Defray cost for all adjustments necessary to bring system up to standards set forth by Contract Documents. All scheduled inspections shall be conducted by a principal of the Electrical Contracting Firm.

END OF SECTION 16100

SECTION 16231 - PACKAGED ENGINE GENERATOR

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes packaged gas-engine generator set with the following features and accessories:
 - 1. Battery Charger.
 - 2. Engine-generator set.
 - 3. Muffler.
 - 4. Exhaust piping external to set.
 - 5. Outdoor enclosure.
 - 6. Remote annunciator.
 - 7. Starting battery.
 - 8. Unit-mounted control and monitoring.
 - 9. Fuel Storage Tank
 - 10. Concrete pad for outdoor mounting.
- B. The engine generator set manufacturer shall provide all equipment under this section. Service technicians specifically trained and certified by the manufacturer to support the product and employed by the generator set supplier shall service both the generator set and transfer switches.
- C. The engine generator set supplier shall be responsible for complete compliance to all specification requirements for both the generator set and transfer switches.

CODES AND STANDARDS

- D. The generator set installation and on-site testing shall conform to the requirements of the following codes and standards, as applicable. The generator set shall include necessary features to meet the requirements of these standards.
 - 1. ANSI S1.13-1971 – Measurement of Sound Pressure Levels in Air
 - 2. CSA 282, 1989 – Emergency Electrical Power Supply for Buildings
 - 3. IEEE 446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
 - 4. NFPA 37 – Standard For the Installation and Use of Stationary Combustion Engines and Gas Turbines
 - 5. NFPA 70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
 - 6. NFPA 110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 2 systems.
- E. The generator set and supplied accessories shall meet the requirements of the following standards:
 - 1. NEMA MG1-1998 part 32. Alternator shall comply with the requirements of this standard.
 - 2. UL1236 – Battery Chargers
 - 3. UL2200. The generator set shall be UL2200 listed and labeled.

- F. The control system for the generator set shall comply with the following requirements.
1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
 2. EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements, Part 2: Industrial.
 3. EN55011 – Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
 4. FCC Part 15, Subpart B.
 5. IEC 8528 part 4 – Control Systems for Generator Sets
 6. IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
- G. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.3 SUBMITTALS

- A. Product Data: Include the following:
1. Data on features, components, accessories ratings, and performance.
 2. Thermal damage curve for generator.
 3. Time-current characteristic curves for generator protective device
- B. Shop drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each connection.
1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
 2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolator bases.
 3. Vibration Isolation Base Details: Detail fabrication, including anchorage and attachments to structure and to supported equipment. Include base weights.
 4. Wiring Diagrams: Power, signal, and control wiring specific to supplied generator set.
- C. Qualification Data: For manufacturer.
- D. Source quality-control test reports:
1. Certified summary of prototype-unit test report.
 2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
 3. Certified Summary of Performance Tests: Demonstrate compliance with specified requirements to meet performance criteria for sensitive loads.
 4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
 5. Report of sound generation.
 6. Report of exhaust emissions showing compliance with applicable regulations.
 7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.
 8. Seismic Certificate.
 9. Factory test procedures.
- E. Field Test Reports: Written reports specified in Part 3.
- F. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section

"Operation and Maintenance Data," include the following:

1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
- G. Warranty: Special warranty specified in this Section.
- H. Written offers of extended warranties, including; all included services, all excluded services, the duration of each specific warranty package, and the cost of each specific package.
- I. Written offers of standard maintenance packages including; all included parts and services, all excluded parts and services, the duration of each specific maintenance package, and the cost of each specific package

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Contractor who is trained and approved for installation of units required for this Project.
- B. Manufacturer Qualifications: A qualified manufacturer who has been manufacturing similar engine-generator sets for at least ten years. Maintain a service center capable of providing training, parts, and emergency maintenance repairs
 1. Service Proximity: Not more than four hours normal travel time from service center to Project site.
 2. Engineering Responsibility: Preparation of data for vibration isolators of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- C. Source Limitations: Obtain emergency standby power system, including packaged generators sets, auxiliary components, and manual transfer switch(es), through one source from a single manufacturer.
- D. Product Selection for Restricted Space: Drawings indicate maximum size, profiles, and dimensional requirements of packaged engine generator sets, including clearances. It is the responsibility of the manufacturer to verify their equipment will satisfy the indicated maximum dimensions.
- E. Welding: Qualify procedures and personnel according ASME Boiler and Pressure Vessel Code: Section IX for welding exhaust-, fuel-, and cooling-system piping.
- F. 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.

1.5 REGULATORY REQUIREMENTS

- A. The generator set overcurrent protection shall be 100 percent rated and UL listed as a utility grade protective device.
- B. Engine Exhaust Emissions: Comply will all applicable state and local government emissions standards at the date of installation
- C. Noise Emission: Comply will all applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine,

engine exhaust, engine cooling-air intake and discharge, and other components of operation. Comply with sound levels requested by the purchasing Owner if they exceed other requirements.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical 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 seven days in advance of proposed interruption of electric service.
 - 2. Indicate method of providing temporary electric service.
 - 3. Do not proceed with interruption of electric service without Owner's written permission.
- B. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 - 1. Ambient Temperature: 0 to 110 deg F. based on temperature measured at the control for indoor installations, and measured at the air inlet closest to the alternator for outdoor equipment.
 - 2. Altitude: Sea level to 1000 feet.

1.7 COORDINATION

- A. Coordinate size and location of concrete base for packaged engine generator. Cast anchor bolt inserts into base. Concrete, reinforcement, and framework requirements are specified in other sections.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship with specified warranty period. Generator supplier shall warranty all products, including the engine generator set equipped with set exerciser, running time meter, and manual transfer switch(es). Multiple warranties are not acceptable.
 - 1. Warranty Period: Five years / 1500 hour standby comprehensive warranty including parts and labor from date of Substantial Completion or registered commissioning and start-up.
 - 2. Comprehensive Warranty: No deductibles shall be allowed for travel time, service hours, repair parts cost, etc. during the warranty period.

1.9 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
 - 1. The supplier shall maintain an inventory of critical power system replacement parts in the local service location.
 - 2. Service vehicles shall be stocked with critical replacement parts.
 - 3. The service organization shall have 24-hour parts and service capability within 100 miles of the project site.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Caterpillar, Engine Division.
 - 2. Cummins Power Generator.
 - 3. Detroit Diesel / DDCMTU.
 - 4. Generac.
- B. Manual transfer switch shall be included with emergency/standby power system and manufactured/supplied, tested, and warranted by same manufacturer.

2.2 ENGINE-GENERATOR SET

- A. Packaged engine-generator set shall be a coordinated assembly of compatible components provided by one distributor.
- B. Capacities and Characteristics:
 - 1. Power Output Ratings: 50 kW at 0.8 PF, standby rating.
 - 2. Motor Starting Capacity: 62.5 kVA.
 - 3. Output Connections: 240 VAC, single-phase, three-wire, 60 hertz.
- C. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.
- D. Mounting Frame: Adequate strength and rigidity to maintain alignment of mounted components without depending on concrete foundation. Mounting frame shall be free from sharp edges and corners and shall have lifting attachments arranged for lifting with slings without damaging components.
 - 1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

2.3 GENERATOR SET PERFORMANCE

- A. Steady-State Voltage Operational Bandwidth: 4 percent of rated output voltage from no load to full load.
- B. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
- C. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
- D. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
- E. Transient Frequency Performance: Less than 5 percent variation for a 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.

- F. Output Waveform: At no load, voltage harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics.
- G. Sustained Short-Circuit Current: For a single-phase, bolted short circuit at system output terminals, the system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
- H. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.4 ENGINE

- A. Fuel: Diesel.
- B. Rated Engine Speed: 1800 rpm.
- C. Four-Cycle Engines Maximum Piston Speed: 2250 fpm.
- D. Lubrication System: The following items are mounted on engine or skid:
 - 1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
 - 2. Thermostatic control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
 - 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances. Fill point shall be well marked and easily accessible.
- E. Engine Fuel System:
 - 1. Main Fuel Valve: Mounted on main storage tank. Pressure ensures adequate primary fuel flow under starting and load conditions.
 - 2. Generator Input Valve: Automatically regulates pressure in fuel line and may either limit fuel flow into unit, or may return excess fuel to storage tank.
- F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 2 equipment for heater capacity. Heater shall be 240V, single-phase, size as required for the generator engine per the manufacturer's recommendation.
- G. Governor: Electronic adjustable isochronous, with speed sensing. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the flow rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed. The governing system shall include a programmable warm up at idle and cool down at idle function. While operating in idle state, the control shall disable the alternator excitation system.

2.5 ENGINE COOLING SYSTEM

- A. Description: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.
- B. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
- C. Radiator Size: Adequate to contain expansion of total system coolant from cold start to 100 percent load condition and for satisfactory performance at 122 deg F ambient temperature.

- D. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
- E. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
- F. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
 - 1. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and non-collapsible under vacuum.
 - 2. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

2.6 FUEL STORAGE

- A. Comply with NFPA.
- B. Comply with UL 142, sub-base, factory-fabricated fuel tank assembly suitable for outdoor installation.
 - 1. Rectangular, sealed, heavy gauge, welded steel construction with reinforced steel box channels for generator support. No galvanized materials.
 - 2. Interior coated with solvent-based rust preventative and ground clearance to minimize bottom rusting.
- C. Containment: Double wall integral rupture basin.
 - 1. Leak Detector: Locate in rupture basin and connect to provide audible and visual alarm in the event of a leak.
- D. Low-Level Alarm Sensor: Liquid-level device operates alarm contacts at 25 percent of normal fuel level.
- E. Piping Connections: Factory or field installed flexible fuel supply and return lines from tank to engine.
- F. Fuel fill port with lockable, vandal-resistant cap.
- G. Tank level indicator, mounted at fuel fill port locations.
- H. Normal and emergency vents.
- I. Capacity: Fuel for 48 hours of operation at 100 percent of rated power output of engine generator system without being refilled.]

2.6 ENGINE EXHAUST SYSTEM

- A. Muffler: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements; sound level measured at a distance of 10 feet from exhaust discharge shall be 85 dBA or less.
- B. Exhaust system shall be installed according to the engine manufacturer's recommendations and applicable codes and standards. Contractor shall consult generator manufacture if additional exhaust ductwork is recommended or required for specific project conditions.

2.6 COMBUSTION AIR INTAKE

- A. Standard duty, engine mounted air cleaner with replaceable dry filter element and "blocked filter" indicator.

2.7 STARTING SYSTEM

- A. Description: 12-V electric, with negative ground and including the following items:
 - 1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Environmental Conditions" Paragraph in "Project Conditions" Article.
 - 2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
 - 3. Cranking Cycle: As required by NFPA 110 for system level specified.
 - 4. Battery: Lead acid type of adequate capacity within ambient temperature range specified in "Environmental Conditions" Paragraph in "Project Conditions" Article to provide specified cranking cycle at least twice without recharging.
 - 5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
 - 6. Battery Rack: Substantially fabricated of metal with acid-resistant finish. Shall include accessories required to support and fasten batteries securely in place.
 - 7. Battery-Charging Alternator: Factory mounted on engine and solid-state voltage regulation and 35-A minimum continuous rating.
 - 8. Battery Charger: Heavy duty industrial service, current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:
 - a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
 - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
 - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
 - d. Ammeter and Voltmeter: Meters shall indicate charging rates.

2.8 CONTROL AND MONITORING

- A. The generator set shall be provided with a microprocessor-based control system that is designed to provide manual starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.
- B. Manual Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the AUTO position, remote-control contacts in one or more separate manual transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the ON position, generator set starts. The OFF position of same switch initiates generator set shutdown and alarm at the engine and remote annunciator panel. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms.
- C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the

generator set. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.

- D. Indicating and protective devices and controls shall include those required by NFPA 110 for a Level 2 system, and the following:
1. AC voltmeter.
 2. AC ammeter.
 3. AC frequency meter.
 4. DC voltmeter (alternator battery charging).
 5. Engine-coolant temperature gage.
 6. Engine lubricating-oil pressure gage.
 7. Running-time meter.
 8. Meters to indicate voltage and ampacity of all phases simultaneously.
 9. Generator-voltage adjusting rheostat.
 10. Start-stop switch.
 11. Overspeed shutdown device.
 12. Coolant high-temperature shutdown device.
 13. Coolant low-level shutdown device.
 14. Oil low-pressure shutdown device.
 15. Fuel tank low level alarm.
 16. Generator overload.
 17. kW meter.
 18. Power factor meter.
- E. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.
- F. Remote Alarm Annunciator: Comply with NFPA 99. Labeled LED shall identify each alarm event. Common audible signal shall sound for alarm conditions. Silencing switch in face of panel shall silence signal without altering visual indication. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

2.9 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Generator Circuit Breaker: Molded-case, thermal-magnetic type; 100 percent rated; complying with NEMA AB 1 and UL 489.
1. Tripping Characteristic: Designed specifically for generator protection.
 2. Trip Rating: Matched to generator rating.
 3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
 4. Mounting: Adjacent to or integrated with control and monitoring panel.
- B. Generator Protector: Microprocessor-based unit that continuously monitors current level in each phase of generator output, integrates generator heating effect over time, and predicts when thermal damage of the alternator will occur. When signaled by the protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from the load circuits. Protector shall perform the following functions:
1. Initiates a generator overload alarm when the generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
 2. Under single or three-phase fault conditions, regulates the generator to 300 percent of rated full-load current for up to 10 seconds.

3. As the overcurrent heating effect on the generator approaches the thermal damage point of the unit, the protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set..
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

2.10 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. The AC generator shall be synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG 1 temperature limits for Class H insulation system and shall be UL 1446 listed. Actual temperature rise measured by resistance method at full load shall not exceed 130 deg C.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.
- D. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- E. Excitation shall use no slip or collector rings, or brushes, and shall be arranged to sustain generator output under short-circuit conditions as specified.
- F. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.
- G. The generator shall be capable of delivering rated output (kW) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.
- H. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase fault at approximately 300% of rated current for not more than 10 seconds.
- I. The subtransient reactance of the alternator shall not exceed 14 percent, based on the standby rating of the generator set.
- J. Minimum motor starting kVA of the generator set shall be provided as indicated on drawings at a maximum 15% instantaneous voltage dip.
- K. Alternator Control Functions:
 1. The generator set shall include a full wave rectified automatic digital voltage regulation system that is matched and prototype tested by the engine manufacturer with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase line to neutral RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below an adjustable frequency threshold. Torque matching characteristics shall be adjustable for roll-off frequency and rate, and be capable of being curve-matched to the engine torque curve with adjustments in the field. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, and

made via digital raise-lower switches, with an alphanumeric LED readout to indicate setting level. Rotary potentiometers for system adjustments are not acceptable.

2. Controls shall be provided to monitor the output current of the generator set and initiate an alarm (over current warning) when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (over current shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.
3. Controls shall be provided to individually monitor all three phases of the output current for short circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (short circuit shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.
4. An AC over/under voltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.

- 2.11 When required by National Electrical Code or indicated on project drawings, the control system shall include a ground fault monitoring relay. The relay shall be adjustable from 3.8-1200 amps, and include adjustable time delay of 0-10.0 seconds. The relay shall be for indication only, and not trip or shut down the generator set. Note bonding and grounding requirements for the generator set and provide relay that will function correctly in system as installed.

2.12 OUTDOOR GENERATOR-SET ENCLOSURE

- A. Prefabricated or preengineered, skintight, sound attenuating enclosure housing instruments, control panel, engine starting batteries, etc with the following features:
1. Construction: Vandal-resistant, weatherproof, galvanized-steel, integral structural-steel framed building attached to generator set base.
 2. Structural Design and Anchorage: Comply with ASCE 7 for wind loads. [Horry County, SC](#).
 3. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents.
 4. Hinged Doors: Multiple doors to provide adequate access to components requiring maintenance with padlocking provisions.
 5. Ventilation: Louvers equipped with bird screen and filter arranged to permit air circulation while excluding exterior dust, birds, and rodents.
 6. Thermal insulation: Manufacturer's standard materials and thickness selected in coordination with heater to maintain winter interior temperature within operating limits required by engine-generator-set components.
 7. Sound insulation: Manufacturer's standard materials and thickness selected in coordination within sound operating limits required. Minimum sound attenuation shall be 30db reduction measured from 23 feet.
 8. Muffler Location: Within enclosure.
- B. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for two hours with ambient temperature at top of range specified. The generator manufacturer is responsible for providing a properly sized system based on the enclosure static pressure restriction.
1. Louvers shall be storm-proof and drainable to prevent entry of rain and screened to prevent entrance of pests. Gravity dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.

2.13 VIBRATION ISOLATION DEVICES

- A. Elastomeric Isolator Pads: Provide oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a non-slip pattern and galvanized-steel base plates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
- B. Restrained Spring Isolators: Provide freestanding, steel, open-spring isolators with seismic restraint.
 - 1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or weight is removed; factory-drilled base plate bonded to 1/4-inch thick, elastomeric isolator pad attached to base plate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
 - 2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of required deflection at rated load.
 - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 5. Overload capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.14 FINISHES

- A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard enamel over corrosion-resistant pretreatment and compatible primer.

2.15 SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories:
 - 1. Tests: Comply with NFPA 110, Level 1 energy converters in Paragraphs 3.2.1, 3.2.1.1, and 3.2.1.2.
 - 2. Generator Tests: Comply with IEEE 115.
 - 3. Components and Accessories: Items furnished with installed unit that are not identical to those on tested prototype shall have been factory tested to demonstrate compatibility and reliability.
- B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests.
 - 1. Full load run.
 - 2. Maximum power.
 - 3. Voltage regulation.
 - 4. Transient and steady-state governing.
 - 5. Single-step load pickup.
 - 6. Safety shutdown.
 - 7. Observation of Factory Tests: Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
- C. Report factory test results within 10 days of completion of test.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.
- B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions, with NFPA 110 and with applicable state and local codes.
- B. Install packaged engine generators level on concrete base. Coordinate size and location of concrete base. Verify structural requirements with structural engineer.
 - 1. Vibration Isolation: Mount packaged engine generators on elastomer isolator pads and restrained spring isolators.
- C. Install packaged engine-generator to provide access, without removing connections or accessories, for periodic maintenance.
- D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.
- E. Equipment shall be initially started and operated by the manufacturer's representative. All protective settings shall be adjusted as instructed by the Engineer.
- F. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.
- G. On completion of the installation by the electrical contractor, the generator set supplier shall conduct a site evaluation to verify that the equipment is installed per manufacturer's recommended practice.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in Division 15 Sections. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements
 - 1. Install fuel system piping adjacent to packaged engine generator to allow service and maintenance.
- B. Ground equipment according to Division 16 Section "Grounding and Bonding for Electrical Systems."
- C. Connect wiring according to Division 16 Section "Low-Voltage Electrical Power Conductors and Cables."

- D. Provide connections from generator control panel to each manual transfer switch for required communications.
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 IDENTIFICATION

- A. Identify system components according to Division 16 Section " Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field-testing.
 - 1. The Manufacturer shall provide a site test specification covering the packaged engine generator set, transfer switches and associated standby emergency system components.
 - 2. The Supplier shall provide the engine lubrication oil and antifreeze, as recommended by the manufacturer, for operation under project environmental conditions.
 - 3. The Contractor shall provide all fuel necessary for field tests and start up.
 - 4. The Engineer shall be notified in advance and shall have the option to witness the tests.
- B. Perform the following field tests and inspections and prepare test reports upon complete installation and startup:
 - 1. Perform tests recommended by manufacturer.
 - 2. The generator set shall be run for two hours continuously with all available building emergency load connected to its output; load shall not exceed 50 percent of generator set rating for first 30 minutes during first initial run for proper engine break-in. Records shall be maintained throughout this period to record water temperature, oil pressure, ambient air temperature, voltage, current, frequency, kilowatts, and power factor. The above data shall be recorded at 15-minute intervals throughout the test. There shall be a 10-minute unloaded run at the conclusion of the test to allow engine to cool before shutdown. The Contractor shall make all necessary hook-ups to accomplish field tests.
 - 3. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, the following:
 - a. Single-step full-load pickup test.
 - 4. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
 - a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
 - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
 - c. Verify acceptance of charge for each element of the battery after discharge.
 - d. Verify that measurements are within manufacturer's specifications.
 - 5. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.

6. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
 7. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg. Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
 8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
 9. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.
 10. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at four locations on the property line, and compare measured levels with required values.
- C. Coordinate tests with tests for transfer switches and run them concurrently.
 - D. Test instruments shall have been calibrated within the last 12 months, traceable to standards of the National Institute for Standards and Technology, and adequate for making positive observation of test results. Make calibration records available for examination on request.
 - E. After installation, charge cooling system and test for leaks. Repair leaks and retest until no leaks exist. Observe for leaks during full load test.
 - F. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - G. Remove and replace malfunctioning units and retest as specified above. Correct deficiencies identified by tests and observations and retest until specified requirements are met.
 - H. Simulated Power Failure Test: Generator set shall be made ready for manual operation and started by means of the test transfer switch on the manual transfer switch. Unit shall run for the duration of two hours plus all time delays and then manually shut down. Coordinate timing and obtain approval for start of test with site personnel.
 - I. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests. Reports shall be included in Operations and Maintenance Manual

3.6 DEMONSTRATION AND TRAINING

- A. Engage a factory-authorized service representative to demonstrate and train Owner's maintenance personnel. Refer to Division 1 Section "Closeout Procedures" or "Demonstration and Training."
 1. Demonstrate the following:
 - a. The completed system functions as specified.
 - b. Manual start and stop by remote signal from transfer switch.
 - c. Manual start and stop at local control panel selector.
 - d. Blocking of remote start operation with Stop selected.
 - e. That remote monitoring panel indications are as specified.

2. Training shall include adjusting, operating, and maintenance of the package engine generator set:
 - a. Coordinate this training with that for the transfer switches.
 - b. Training shall be at least four hours in duration and the class size shall be limited to five persons.
 - c. Training date shall be coordinated with the Owner

3.7 SERVICE AND SUPPORT

- A. Startup: Engage a factory-authorized service representative to perform startup service.
 1. Inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.
 2. Complete installation and startup checks according to manufacturer's written instructions before performing load tests.
- B. The manufacturer of the engine generator set shall maintain a central parts inventory to support the supplier, covering all the major components of the power system, including engines, alternators, control systems, and power transfer equipment.
- C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

END OF SECTION 16231

SECTION 16415 - TRANSFER SWITCHES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes transfer switches rated 600 V and less, including the following:
 - 1. Automatic transfer switches.
 - 2. Automatic closed-transition transfer switches.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Dimensioned plans, sections, and elevations showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.
- C. Field Test Reports: Written reports specified in Part 3.
- D. Warranties: Special warranties specified in this Section.
- E. Operation and Maintenance Data: For each type of product to include in operation and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
 - 1. Features and operating sequences, both automatic and manual.
 - 2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.
 - 3. Complete wiring diagrams for the specific system provided.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification. The manufacturer shall have been regularly engaged in the production of UL 1008 listed transfer switches (that are brand names, documented, and offered for sale on the open market) for a minimum of five years, and shall provide factory trained parts and service support through a factory authorized distributor or service center that is regularly doing business in the area of the installation.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for emergency service under UL 1008, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NEMA ICS 1.
- D. Comply with NFPA 70.

- E. Comply with NFPA 110.
- F. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of the automatic transfer switch that fail in materials or workmanship with specified warranty period.
 - 1. Warranty Period: Five years from registered commissioning and start-up or 1,500 operating hours.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: The transfer switch shall be manufactured/supplied, tested, and warranted by the manufacturer of the generator set to ensure one source of responsibility and compatibility for the complete emergency/standby power system. Refer to Division 16 Section "Packaged Engine Generator-Diesel" for approved manufacturers.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

- A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer.
- B. Main contacts shall be rated for 600 VAC minimum.
- C. Transfer switches shall be rated to carry 100% of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C (-40 to +140 degrees F), relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet (3000 meters).
- D. Tested Fault-Current Closing and Withstand Ratings: UL 1008 WCR ratings must be specifically listed as meeting the requirements for use with protective devices at installation locations, under specified fault conditions. Withstand and closing ratings shall be based on use of the same set of contacts for the withstand test and the closing test.
- E. Solid-State Controls: Repetitive accuracy of all settings is plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
- F. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- G. Neutral Terminal: Solid and fully rated, unless otherwise indicated.
- H. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.
 - 1. The enclosure shall provide wire bend space in compliance to the latest version of NFPA 70, regardless of the direction from which the conduit enters the enclosure.
 - 2. Transfer switches shall be provided in enclosures that are third party certified for their intended environment per NEMA requirements.

- I. Control: Transfer switch control shall be capable of communicating with the genset control, other switches and remote programming devices over a high-speed network interface.
- J. Factory wiring: Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism.
- K. Terminals: Terminals shall be pressure type and appropriate for all field wiring. Terminal arrangement and cabinet space must be such that feeder conductors can enter from the top, side or bottom of the switch, at the installer's discretion. Control wiring shall be equipped with suitable lugs, for connection to terminal strips. Electrical Operation: Accomplish by a non-fused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions (except that mechanical interlock is not required for closed transition switches).
- L. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
 - 1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
 - 2. Switch Action: Double throw; electrically and mechanically interlocked, and mechanically held in the Source 1 and Source 2 positions.
 - 3. Contacts: High-pressure silver alloy for load-current switching. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.
 - 4. Contacts shall be operated by a high-speed electrical mechanism that causes contacts to open or close within three electrical cycles from signal.
 - 5. The transfer switch operation shall include the ability to switch to an open position (both sources disconnected) for the purpose of load shedding from the generator set.
 - 6. The power transfer mechanism shall include provisions for manual operation under load with the enclosure door closed. Manual operation may be electromechanical or mechanical, but must be coordinated with control function.
 - 7. Transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.
 - 8. The transfer switch shall include the mechanical and control provisions necessary to allow the device to be field-configured for operating speed. Transfer switch operation with motor loads shall be as is recommended in NEMA MG1.

2.3 AUTOMATIC TRANSFER SWITCHES

- A. Comply with Level 1 equipment according to NFPA 110.
- B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.
- C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.
- D. Relay Signal: Control shall include provisions for addition of a pre-transfer relay signal, adjustable from 0 to 60 seconds, to be provided if necessary for elevator operation, based on equipment provided for the project.
- E. Control: Transfer switch control shall be provided with necessary equipment and software to

communicate with the generator set control, remote annunciation equipment, and other devices over a high speed control network.

- F. Neutral Switching: Transfer switches designated as 4-pole shall be provided with a switched neutral pole. The neutral pole shall be of the same construction and have the same ratings as the phase poles. All poles shall be switched simultaneously using a common crossbar. Substitute equipment using overlapping neutral contacts is not acceptable.
- G. Automatic Closed-Transition Transfer Switches: Include the following functions and characteristics:
 - 1. Fully automatic make-before-break operation.
 - 2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
 - 3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.
 - a. Initiation occurs without active control of generator.
 - b. Controls ensure that closed-transition load transfer closure occurs only when the 2 sources are within plus or minus 5 electrical degrees maximum, and plus or minus 5 percent maximum voltage difference.
 - 4. Failure of power source serving load initiates automatic break-before-make transfer.
 - 5. The control system shall actively monitor operating speed and automatically adjust operation timing to retain sync check function precision. The controls shall monitor the operating speed of the contact mechanism, and adjust sync check parameters to result in contact closure within acceptable ranges as the equipment ages. Sync check window and time delay shall be field adjustable.
 - 6. The transfer switch shall be provided with all equipment necessary and all functions required for compliance with the requirements for momentary closed-transition operation with the local utility. As a minimum, equipment will include a contact closure to indicate transfer switch has failed to disconnect the generator set from the utility during closed-transition transfer. Contacts will be used to trip the upstream (genset or utility) breaker.
- F. Fail-to-disconnect timer prevents engine damage by disconnecting either generator or utility if transfer is unsuccessful.

2.4 AUTOMATIC TRANSFER-SWITCH FEATURES

- A. Transfer Switch Control Panel: The transfer switch shall have a microprocessor-based control with a sealed membrane panel incorporating pushbuttons for operator-controlled functions, and LED lamps for system status indicators. The panel shall also include an alphanumeric display for detailed system information. Panel display and indicating lamps shall include permanent labels.
 - 1. The indicator panel LEDs shall display:
 - a. Which source the load is connected to (Normal or Emergency).
 - b. Which source or sources are available.
 - c. When switch is not set for automatic operation.
 - d. When the switch is in test/exercise mode.
 - 2. The indicator shall have pushbuttons that allow the operator to activate the following functions:
 - a. Activate pre-programmed test sequence
 - b. Override programmed delays, and immediately go to the next operation
 - c. Reset the control by clearing any faults
 - d. Test all of the LEDs by lighting them simultaneously

3. The alphanumeric digital display shall be vacuum fluorescent-type, clearly visible in both bright sunlight and no-light conditions over an angle of 120 degrees, and shall display the following:
 - a. AC voltage for all phases, normal and emergency
 - b. Source status: connected or not connected.
 - c. Load data, including voltage, AC current, frequency, KW, KVA, and power factor.
 4. The display panel shall be password-protected, and allow the operator to view and make adjustments:
 - a. Set nominal voltage and frequency for the transfer switch
 - b. Adjust voltage and frequency sensor operation set points
 - c. Set up time clock functions
 - d. Set up load sequence functions
 - e. Enable or disable control functions including program transition
 - f. View real-time clock data, operation log (hours connected, times transferred, failures) and service history
- B. Control Functions: Functions managed by the control shall include:
1. Software adjustable time delays:
 - a. Engine start: 0 to 120 seconds (default 3 sec)
 - b. Transfer normal to emergency: 0 to 120 seconds (default 3 sec)
 - c. Re-transfer emergency to normal: 0 to 30 minutes (default 3 sec)
 - d. Engine cooldown: 0 to 30 minutes (default 10 min)
 2. Programmed transition: 0 to 60 seconds (default 3 sec)
 3. Undervoltage sensing: three-phase normal, three-phase emergency source.
 - a. Pickup: 85 to 98% of nominal voltage (default 90%)
 - b. Dropout: 75 to 98% of nominal voltage (default 90%)
 - c. Dropout time delay: 0.1 to 1.0 seconds (default 0.5 sec)
 - d. Accurate to within +/- 1% of nominal voltage
 4. Over-voltage sensing: three-phase normal, three-phase emergency source.
 - a. Pickup: 95 to 99% of dropout setting (default 95%)
 - b. Dropout: 105 to 135% of nominal voltage (default 110%)
 - c. Dropout time delay: 0.5 to 120 seconds (default 3 sec)
 - d. Accurate to within +/- 1% of nominal voltage
 5. Over/under frequency sensing:
 - a. Pickup: +/- 5 to +/-20% of nominal frequency (default 10%)
 - b. Dropout: +/-1% beyond pickup (default 1%)
 - c. Dropout time delay: 0.1 to 15.0 seconds (default 5 sec)
 - d. Accurate to within +/- 0.2%
 6. Voltage imbalance sensing:
 - a. Dropout: 2 to 10% (default 4%)
 - b. Pickup: 90% of dropout
 - c. Time delay: 2.0 to 20 seconds (default 5 sec)

7. Phase rotation sensing:
 - a. Time delay: 100 ms
 8. Loss of single-phase detection:
 - a. Time delay: 100 ms
- C. Control features shall include:
1. Programmable genset exerciser: A field-programmable control shall periodically start the generator, transfer the load to generator for a preset time, then re-transfer and shut down the generator after a preset cool-down period.
 - a. Push-button programming control shall have a selection of eight different schedules for exercising generator, with or without load.
 2. In event of a loss of power to the control, all control settings, real-time clock setting and the engine start-time delay setting will be retained.
 3. The system continuously logs information including the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. An event recorder stores information, including time and date-stamp, for up to 50 events.
 4. Transfer Override Switch: Overrides automatic re-transfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light to indicate override status.
- D. Control Interface
1. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.
 2. The transfer switch shall be provided with a network communication card, and configured to allow network-based communication with the transfer switch and other network system components, including the generator set(s) provided for the Project.
 3. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240 VAC.
- E. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10A at 32 VDC minimum.
- F. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
- G. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
1. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
 2. Push-button programming control with digital display of settings.
 3. Integral battery operation of time switch when normal control power is not available.

2.5 FINISHES

- A. Enclosures: Manufacturer's standard enamel over corrosion-resistant pretreatment and primer.

2.6 SOURCE QUALITY CONTROL

- A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 – EXECUTION

3.1 APPLICATION

- A. Four-Pole Switches: Where four-pole switches are indicated, install neutral switching.

3.2 INSTALLATION

- A. Install floor-mounted transfer switch level on concrete base.

3.3 WIRING TO REMOTE COMPONENTS

- A. Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

3.4 CONNECTIONS

- A. Ground equipment and connect wiring according to Division 16 Section "Basic Materials and Methods."
- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: The supplier of the transfer switch and associated equipment shall inspect, test, and adjust components, assemblies, and equipment installations, including connections, and report results in writing.
- B. The following field tests and inspections shall be performed:
 - 1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.22.3. Certify compliance with test parameters.
 - 3. Perform recommended installation tests as recommended in manufacturer's installation and service manuals.
 - 4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
 - a. Check for electrical continuity of circuits and for short circuits.

- b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
 - c. Verify that manual transfer warnings are properly placed.
 - d. Perform manual transfer operation.
- 5. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.
 - a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
 - b. Verify time-delay settings.
 - c. Verify pickup and dropout voltages by data readout or inspection of control settings.
 - d. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.
- C. Coordinate tests with tests of generator and run them concurrently.
- D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- E. Remove and replace malfunctioning units and retest as specified above.
- F. Closeout Submittals:
 - 1. Product Data.
 - 2. Warranty Information.
 - 3. Test Reports.

3.6 DEMONSTRATION

- A. After generator set and transfer switch installation, the supplier shall conduct a complete operation, basic maintenance, and emergency service seminar covering generator set and transfer switch equipment, for up to 10 people employed by the Owner.
 - 1. The seminar shall include instruction on operation of the transfer equipment, normal testing and exercise, adjustments to the control system, use of the PC based service and maintenance tools provided under this contract, and emergency operation procedures
 - 2. Coordinate this training with that for generator equipment.

END OF SECTION 16415

SECTION 16725 – ADDRESSABLE FIRE ALARM SYSTEM

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. This Contractor shall supply and install a complete and ready-to-use fire alarm system as described herein and shown on the plans. The intent of these specifications is to provide a complete and satisfactorily operating system with all equipment and installation materials required, whether or not enumerated herein or shown on the plans. Coordinate with the architectural, electrical and mechanical plans to insure proper locations of detectors and indicating appliances.
- B. Submittals: Provide submittals of the following as described in 16010 General Provisions.
 - 1. The equipment manufacturer shall furnish the following for the Engineer's approval prior to installation.
 - a. Product Data: For each type of product indicated.
 - b. Shop Drawings:
 - i. Shop Drawings shall be prepared by persons who are trained and certified by manufacturer in fire alarm system design.
 - ii. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
 - iii. Device Address List: Coordinate with final system programming.
 - iv. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.
 - v. Wiring Diagrams: Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.
 - vi. Batteries: Size calculations.
 - vii. Voice/Alarm Signaling Service: Equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
 - viii. Floor Plans: Indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.
 - 2. Submittals to Authorities Having Jurisdiction: In addition to distribution requirements for submittals above make an identical submittal to authorities having jurisdiction. To facilitate review, include copies of annotated Contract Drawings as needed to depict component locations. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.
- C. Documentation: Upon completion of the system installation and before final inspection, the equipment manufacturer shall thoroughly check the fire alarm system. A Certification Letter shall be submitted to the Engineer that each manual pull station, detector, notification appliance, etc. have been checked and are as specified, that all devices have been labeled, that As-Built wiring diagrams have been prepared and the Owner's Representatives have been instructed in the operation and maintenance of the fire alarm system

1.2 PERFORMANCE REQUIREMENTS

- A. Comply with NFPA 72.
- B. The fire alarm system shall provide the following features:
 - 1. Supervision.
 - 2. Non-coded continuous ringing.
 - 3. Fan shutdown of air handling units.
 - 4. Standby battery power as required.
 - 5. 500 event data logger with prioritization.
 - 6. Event display with priority sequence and user-friendly scanning capability.
 - 7. Time/event based scheduling system.
 - 8. Real time clock.
 - 9. Programmable features.
 - 10. Test timer.
 - 11. Surge suppressor circuits.
 - 12. Identification, annunciation and communication of alarmed detectors by point.
 - 13. Capability to segregate points into separate, independent areas.
 - 14. Modular construction expandable using hard-wired address identifications modules.
 - 15. Electrically supervised detection loops and programmed communication with Fire Alarm Annunciator Panel (FAAP).
 - 16. Other features as required by this specification.
- C. Fire alarm signal initiation shall be by one or more of the following devices:
 - 1. Manual stations.
 - 2. Heat detectors.
 - 3. Smoke detectors.
 - 4. Automatic sprinkler system water flow.
 - 5. Indicating appliances.
 - 6. Mechanical shut-off and control devices.
- D. Fire alarm signal shall initiate the following actions:
 - 1. Alarm indicating appliances shall operate continuously.
 - 2. Identify alarm at the FACP and remote annunciators.
 - 3. Transmit an alarm signal to the remote alarm receiving station.
 - 4. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.
 - 5. Close smoke dampers in air ducts of system serving zone where alarm was initiated.
 - 6. Record events in the system memory.
- E. Supervisory signal initiation shall be by one or more of the following devices or actions:
 - 1. Operation of a fire-protection system valve tamper.
- F. System trouble signal initiation shall be by one or more of the following devices or actions:
 - 1. Open circuits, shorts and grounds of wiring for initiating device, signaling line, and indicating appliance circuits.
 - 2. Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.
 - 3. Loss of primary power at the FACP.
 - 4. Ground or a single break in FACP internal circuits.
 - 5. Abnormal AC voltage at the FACP.
 - 6. A break in standby battery circuitry.

7. Failure of battery charging.
 8. Abnormal position of any switch at the FACP or annunciator.
- G. System Trouble and Supervisory Signal Actions: Ring trouble bell and annunciate at the FACP.
- H. Electrical Supervision shall include the following functions/features:
1. Battery Charger voltage/charging status.
 2. Programmable for supervision and detection of loops and power supplies.
 3. Monitoring and switching to a functional telephone when necessary.
 4. Programmable to arm/disarm a specific area, bypass/un-bypass a point, activate/deactivate a relay, send a test report, execute a custom keystroke function, and adjust system clock for daylight saving time.
 5. Programmable to designate assigned alarm areas with manual bypass.
 6. Support of "group zoning".
 7. Capable of reporting and communicating alarm or trouble event information to one or more annunciator panels.
 8. Programmable locally or remotely.
 9. Capable of executing diagnostics and testing functions locally or remotely.
- I. Failure of any supervised circuit shall operate the assigned system trouble signals. Furnish audible trouble signal silencing switches with ring back or automatic reset feature. Operating power shall be obtained from the building power system. General power failure shall cause a trouble signal to indicate that fire alarm system is operating from emergency power system. Upon restoration of normal power or transfer to the standby generator, the trouble signal shall ring back or automatically return to normal. System must not go into alarm mode in event of power failure or momentary interruption of power.
- J. User programmable/activated systems shall include at least the following:
1. Arming and dis-arming all parts of the system.
 2. Viewing the system status for faulted points, event memory, bypassed points, area status, and point status.
 3. Implementing functions such as point bypass, sensor reset, bell silencing, activating relays, and initiating remote programming either locally or remotely.
 4. Testing the system via both local walk and service walk, fire testing, sending a report to remote location to check the telephone link, and programming the time and date for the next text report transmission.
 5. Changing system parameters such as display brightness, system time and date, and add/delete/change pass codes.
 6. Extending the closing time of the system.
 7. Transmitting special alerts and activating audible and visible signals.
 8. Executing multiple commands from a single menu/command list item.
 9. Editing the time/event based scheduling program.
 10. Activating a service menu for functions such as viewing and printing the system log, displaying the system firmware revision number, and defaulting text displays between custom and default text displays for troubleshooting.

1.3 QUALIFICATIONS

- A. Manufacturer: Firm regularly engaged in manufacture of fire alarm systems of types, sizes, and electrical characteristics required, and whose products have been in satisfactory use in similar service for not less than five years.

- B. Installer: Firm with at least five years of successful installation experience on projects with fire alarm systems work similar to that required for this project and shall be certified by the manufacturer of equipment being installed.
- C. Firm shall be prepared to furnish evidence of qualifications to the Engineer, if requested.
- D. 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.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Edwards System Technology (EST) or Fire Lite Alarms

- 1. Contact: ADT (843) 294-6282

- B. Wire and Cable

- 1. Belden Div., Cooper Industries.
- 2. General Cable Corporation.
- 3. West Penn Wire/CDT; a division of Cable Design Technologies.

2.2 FIRE ALARM CONTROL PANEL (FACP)

- A. General Description:

- 1. Modular, power-limited design with electronic modules, UL 864 listed.
- 2. Addressable initiation devices that communicate device identity and status.
 - a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at the FACP.
 - b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
- 3. Addressable control circuits for operation of mechanical equipment.
- 4. Surface mounted cabinet and sufficient size and depth to accommodate all necessary components and spare spaces. Panel shall be constructed of not less than 16-gauge sheet steel with flush or blind fasteners. Hinges are to be piano type hinge for full length of opening. Door to cabinet shall have a viewing window to observe panel status and a keyed lock to prevent unauthorized entry.
- 5. Lights shall be normally off, except that a continuous operating green light shall indicate that system is operating. An alarm signal shall light a red light. A trouble or emergency power signal shall light an amber light.

- B. Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

- 1. Annunciator and Display: Liquid-crystal type.
- 2. Keypad: Arranged to permit entry and execution of programming, display, and control commands; and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

3. Audible alarm signal circuit designed to electrically supervise all circuit wiring.
4. Lights shall be normally off, except that a continuous operating green light shall indicate that system is operating. An alarm signal shall light a red light. A trouble or emergency power signal shall light an amber light.

C. Circuits:

1. Initiating Device Circuits (IDC): NFPA 72, Class B, Style B.
2. Indicating Appliance Circuits (IAC): NFPA 72, Class B, 2-wire, Style Y.
3. Signaling Line Circuits (SLC): NFPA 72, Class B, Style 4.

D. Notification-Appliance Circuit: Operation shall sound in a temporal pattern, complying with ANSI S3.41.

E. Power Supply for Supervision Equipment: Supply for audible and visual equipment for supervision of the ac power shall be from a dedicated dc power supply, and power for the dc component shall be from the ac supply.

F. Alarm Silencing, Trouble, and Supervisory Alarm Reset: Manual reset at the FACP and remote annunciators, after initiating devices are restored to normal.

1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

G. Walk Test: A test mode to allow one person to test alarm and supervisory features of initiating devices. Enabling of this mode shall require the entry of a password. The FACP and annunciators shall display a test indication while the test is underway. If testing ceases while in walk-test mode, after a preset delay, the system shall automatically return to normal.

H. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and control of changes in those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and make a print-out of the final adjusted values on the system printer.

I. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, trouble, and supervisory signals to a remote alarm station through a digital alarm communicator transmitter and telephone lines.

J. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signal, supervisory and digital alarm communicator transmitter shall be powered by the 24-V dc source.

1. The alarm current draw of the entire fire alarm system shall not exceed 80 percent of the power-supply module rating.

K. Secondary Power: 24-V dc supply system with batteries and automatic battery charger and an automatic transfer switch.

1. Battery and Charger Capacity: Comply with NFPA 72.

- L. Surge Protection: Install surge protectors recommended by FACP manufacturer. Install on all system wiring external to the building housing the FACP.
- M. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.3 MANUAL FIRE ALARM BOXES

- A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. The word FIRE is engraved in minimum 1/2-inch-high letters. 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 the FACP.
 - 2. Station Reset: Key- or wrench-operated switch, keyed alike with FACP.
 - 3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.

2.4 SYSTEM SMOKE DETECTORS

- A. General Description:
 - 1. UL 268 listed, operating at 24-V dc, nominal.
 - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
 - 3. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of building wiring.
 - 4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
 - 5. Integral Visual-Indicating Light: LED type. Indicating detector has operated status.
 - 6. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
- B. Provide multiple levels of detection sensitivity for each sensor.
 - 1. Photoelectric Smoke Detectors:
 - a. Sensor: LED or infrared light source with matching silicon-cell receiver.
 - b. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

2.5 HEAT DETECTORS

- A. General: UL 521 listed.

- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or rate-of-rise of temperature that exceeds 15 deg F per minute, unless otherwise indicated.

- 1. Mounting: Plug-in base, interchangeable with smoke-detector bases.
- 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.6 INDICATING APPLIANCES

- A. Description: 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.
- 2. Alarm units shall be complete with modular or integral system interface equipment. Power supplies, where required, shall be included

- B. Audible alarm horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille and shall contain a minimum of 6 square inches of perforated openings. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn.

- 1. Audible alarm horns have been located on the drawings. It is the Contractor=s responsibility to provide adequate coverage to achieve dBA levels to notify occupants at all locations throughout the building. If locations shown are inadequate, show additional indicating appliances on shop drawing submittal. Additional indicating appliances will be added at no additional cost to the contract including conduit, conductors, power supplies, etc.

- C. Visible Alarm Devices: Xenon strobe lights listed under 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: 15 candella or as indicated on drawings.
- 2. All visual alarms shall be synchronized.
- 3. Strobe Leads: Factory connected to screw terminals.

2.7 SPRINKLER SYSTEM REMOTE INDICATORS

- A. Remote status and alarm indicator and test stations, with LED indicating lights. Light is connected to flash when the associated device is in an alarm or trouble mode. Lamp is flush mounted in a single-gang wall plate. A red, laminated, phenolic-resin identification plate at the indicating light identifies, in engraved white letters, device initiating the signal and room where the smoke detector or valve is located. For water-flow switches, the identification plate also designates protected spaces downstream from the water-flow switch.

2.8 FIRE ALARM ANNUNCIATOR PANEL (FAAP)

- A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate manual switching functions of the FACP, including acknowledging, silencing, resetting, and testing.

- 1. Flush cabinet, NEMA 250, Class 1. Cabinet shall be lockable, keyed alike with FACP.

- B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LEDs permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP. Lights shall be normally off as described for the FACP.

2.9 ADDRESSABLE INTERFACE DEVICE

- A. Description: Microelectronic monitor module listed for use in providing a system address for listed alarm-initiating devices for wired applications with normally open contacts.
- B. Integral Relay: Capable of providing a direct signal to controlled device.

2.10 DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Listed and labeled according to UL 632.
- B. Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP, and automatically captures one or two telephone lines and dials a preset number for a remote central station. When contact is made with the central station(s), the signal is transmitted. The unit supervises up to two telephone lines. Where supervising 2 lines, if service on either line is interrupted for longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. When telephone service is restored, unit automatically reports that event to the central station. If service is lost on both telephone lines, the local trouble signal is initiated.
- C. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.
- D. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.11 STANDBY BATTERY

- A. Standby battery shall be in wall mounted cabinet and shall be either nickel-cadmium type or sealed, maintenance free type, with sufficient capacity to operate the system under maximum normal load for 24 hours with the ability to sustain 10 minutes in alarm at the end of the backup period.
- B. The fire alarm equipment supplier shall furnish a detailed summary of the method used in computing the load and battery size for this system requirement.
- C. Battery charger shall be mounted in the battery cabinet and shall be fully compatible with the furnished battery, with automatic switching from trickle charge to booster rate as demanded by battery condition and use. The charging current shall be such that the battery is restored to the required operating charge within 48 hours from a completely discharged condition. Charger shall have necessary controls to prevent over-charging.

2.12 WIRE AND CABLE

- A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.
- B. Signaling Line Circuits: Twisted, shielded pair, size as recommended by system manufacturer.
- C. All conductors for low voltage wiring shall be solid copper #14 AWG minimum, THW or THHN-THWN and shall be color-coded as recommended by equipment manufacturer and/or as specified on drawing.
- D. All conductors for line voltage shall be solid copper #12 AWG minimum, THW or THHN-THWN.

PART 3 – EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. The equipment under these specifications shall be UL approved and all work in conjunction with this installation shall meet the requirements of the National Electrical Code, applicable requirements of NFPA 72, the SBCCI and local codes. 'Like' components of the system shall be the product of one manufacturer, and all components of the system must be compatible.
- B. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
- C. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.
- D. Audible & Visual Indicating Appliance: Install at 96-inches above finished floor or 6-inches below the ceiling, whichever is lower and their visibility must not be obstructed by structure, equipment, etc.
- E. FACP: Surface mount with tops of cabinets not more than 78 inches above the finished floor.
- F. Annunciator: Install with top of panel not more than 54 inches above the finished floor.

3.2 WIRING INSTALLATION

- A. Install wiring according to the following:
 - 1. NECA 1.
 - 2. TIA/EIA 568-A.
- B. The system wiring shall be installed in accordance with this specification and the manufacturer's recommendations, and shall be in rigid conduit or electrical metallic tubing (EMT), which shall be galvanized steel, sized as recommended by the equipment manufacturer and in strict accordance with NFPA 72, the National Electrical Code, and all other applicable codes. The system shall test free from grounds, opens, or short circuits, addressable and supervised.
 - 1. 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.
 - 2. Signaling Line Circuits: Power-limited fire alarm cables shall not be installed in the same cable or raceway as signaling line circuits
- 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 a different color-code 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. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.3 SERVICE FACILITIES

- A. The supplier's service department must stock parts for the equipment installed and shall provide factory trained personnel on the premises when required. Routine maintenance is to be provided during normal working hours at no cost to the Owner during the warranty period.

- 3.4 A contract marked "Paid in Full" for inspection and servicing (exclusive of dust and line cleaning) for the first year of the warranty period shall be given to the Owner after Owner's acceptance of the system. The contract shall provide for a minimum of two inspections per year. The Owner shall have the opportunity to negotiate a maintenance and inspection contract for yearly periods which shall provide a minimum of two inspections during each 12-month period.

3.5 TESTS:

- A. Before acceptance test is performed, complete system must have been in operation for a minimum of 48 continuous hours. Before acceptance, each unit of the alarm system shall be tested by the manufacturer's factory trained representative in the presence of the Engineer and a representative of the Owner. Test of smoke detectors must include an electrical test and a smoke test. Verify that alarm signal has been properly connected to the municipal alarm equipment.

3.6 FINAL ACCEPTANCE

- A. Before final acceptance, the complete system shall be tested in the presence of a representative of the Owner who shall certify, along with the Engineer, in letter-form that the complete system is in satisfactory operating condition.
- B. The complete fire alarm system shall operate satisfactorily before final acceptance and payment for the fire alarm system is made.

3.7 RECORD DOCUMENTS, MANUAL, INSTRUCTION

- A. During construction, the Contractor shall maintain a set of updated record construction documents showing exact locations of all equipment and other changes to the plans at the job site. All record drawings shall be completed in erasable pencil. These changes shall be updated weekly. Upon project completion, this set shall be turned over to the Owner/Engineer or authorized representative.
- B. Operation and Maintenance Data: Submit (three copies) maintenance data and parts lists for each type of fire alarm equipment installed, including furnished specialties and accessories. Include this data, product data, shop drawings, etc. in hard-back bound manual.
- C. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the fire alarm system, appliances, and devices.

3.8 WARRANTY

- A. Upon acceptance of the fire alarm system, the supplier shall assume complete responsibility for the service and replacement of any defective equipment installed by him during the warranty period

of one year. The supplier will not be responsible for replacing or repairing any unit of the system damaged by physical abuse, vandalism, or improper servicing and maintenance if servicing and maintenance is not performed by the supplier or his approved agent.

- B. Any component provided under this contract which fails in operation shall be promptly removed and replaced at no cost to Owner and given an extension of warranty until all components have given one full year of satisfactory service.

END OF SECTION 16725

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers all work associated with the removal of trees and vegetation and the disposal of such material.

1.2 DEFINITIONS

- A. Clearing: The felling, trimming, cutting and disposal of trees and other vegetation to include brush.
- B. Grubbing: The removal and disposal of roots, matted roots, stumps, organic and metallic debris, and refuse to a depth not less than 18 inches.
- C. Saleable Timber: Felled trees which could be used as saw logs, pulpwood, posts, poles, ties or fuel wood.
- D. Non-Saleable timber: Timber, scrub, vegetation and other debris considered as non-saleable.
- E. Tree: Any living, self-supporting, woody perennial plant.
 - 1. Refer to Horry County Zoning Ordinance, Table 5, Section 527.3 – Tree Preservation for definition of Protected & Specimen Trees.
- F. Protective Barricade: A physical structure not less than 4 feet in height, limiting access to a tree.

1.3 LUMP SUM PRICE

- A. The items listed in the bid shall be considered sufficient to complete the work in accordance with the drawings and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for all material, equipment, labor, testing, construction supervision and all other work required for satisfactory completion of site clearing.

1.4 UNIT PRICES

- A. None this Section.

1.5 SUBMITTALS

- A. None this Section.

1.6 REGULATORY REQUIREMENTS

- A. Comply with Federal, State, and local regulations.
- B. Comply with the requirements of the land disturbance permit and stamped approved drawings issued for this project by South Carolina Department of Health and Environmental Control (SCDHEC) and/or the MS4.
- C. Burning shall not be allowed.

1.7 QUALITY ASSURANCE

- A. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the contacts who are familiar with his competence may be required to be submitted to verify experience.
- B. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CLEARING

- A. Clearing shall consist of the felling and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring within the area to be cleared. Trees, stumps roots, brush and other vegetation in areas to be cleared shall be removed completely from the site to an area designated by the Owner, except such trees and vegetation as may be indicated or directed to be left standing.
- B. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1.5 inches or more in diameter. Limbs and branches to be trimmed shall be neatly cut close to the hole of the tree or main branches. Cuts more than 1.5 inches in diameter thus made shall be painted with a tree wound paint.
- C. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations, by erection of timber barriers or by such other means as circumstances require. Such barriers must be placed and be approved by the Engineer before construction activities can proceed.
- D. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work.
- E. Clearing operations shall be conducted to prevent damage by falling trees to trees left standing, to existing structures and installation, and to those under construction, and so as to provide for the safety of employees and others.

3.2 GRUBBING

- A. Grubbing shall consist of the removal and disposal of stumps, roots larger than 0.25 inches in diameter, and matted roots from the designated grubbing areas. This material, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be excavated and removed to a depth of not less than 18 inches below the original surface level of the ground in embankment areas and not less than 24 inches below the finished earth surface in excavated areas.
- B. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground at no additional cost to the Owner.

3.3 TREE REMOVAL

- A. Where indicated or directed, trees and stumps shall be removed from areas outside those areas designated for clearing and grubbing. The work shall include felling of such trees and the removal of their stumps and roots. Trees shall be disposed of as specified.

3.4 DISPOSAL

- A. Disposal of trees, branches, snags, brush, stumps, etc., resulting from the clearing and grubbing shall be the responsibility of the Contractor and shall be disposed of by removal from the site.
- B. Disposal by hauling, if necessary, shall be at no additional cost to the Owner.
- C. All liability of any nature resulting from the disposal of the cleared and grubbed material shall become the responsibility of the Contractor.
- D. Disposal by burning shall not be allowed.
- E. All costs in connection with disposing of the material will be at the Contractor's expense.

3.5 EXISTING TREE PROTECTION

- A. All trees on the site will be saved except those marked specifically for removal. No trees, either those marked for removal on the site or any other tree, may be removed from the site prior to the preconstruction conference.
- B. All trees not to be removed will be protected from injury to their roots and to their top to a distance 3 feet beyond the drip line and no grading, trenching, pruning, or storage of materials may go in this area.

3.6 PENALTIES AND FINES

- A. The Contractor will pay any penalties or fines assessed by the Municipality for any tree removed from the site that has not been marked specifically for removal.
- B. The Contractor may also pay for any tree that dies due to damage during construction. This applies to all trees on the site regardless if they are shown on the drawings.
- C. The Contractor shall not be held accountable for trees damaged resulting from placement of fill or removal of soils where such action is required by the Contract Documents.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers all work associated with stripping, subgrade preparation, filling, backfilling, compaction and disposition of surplus soil materials.

1.2 DEFINITIONS

- A. Subgrade: Existing, in-situ soil or other material that is remaining after stripping or excavation. The subgrade is always existing material on which fill, or new structures are to be placed.
- B. Excavation: The removal of soil or material to obtain a specified depth or elevation.
- C. Borrow: Material that must be transported to the site. A material that must be developed by others and transported to the site. Not available on site.
- D. Fill: Soil or material placed above the subgrade to the point of new construction such as a sub-base, base course, pavement, foundation, footing, or building component.
- E. Backfill: Fill material used in refilling a cut, trench or other excavation.
- F. Lift: A layer or course of material placed on top of a previously prepared or placed material.
- G. Rock: Solid, homogeneous interlocking crystalline material with firmly cemented, laminated or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe mounted pneumatic hole punchers or rock breakers; also, large boulders, buried masonry, or concrete other than pavement, exceeding 25 cubic yards in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.
- H. Topsoil: In natural or undisturbed soil formations, the fine grained, weathered material on the surface or directly below any loose or partially decomposed organic matter. Topsoil may be dark-colored, fine, silty or sandy material with a high content of well decomposed organic matter, often containing traces of the parent rock material. The material shall be representative of productive soils in the vicinity.
- I. Unsuitable Material: Existing, in situ soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in fill or embankment without excessive consolidation or loss of stability. Materials classified as PT, OH, or OL by ASTM D 2487 are unsuitable. Unsuitable materials also include man-made fills, refuse, frozen material, uncompacted backfills from previous construction, unsound rock or soil lenses, or other deleterious, organic or objectionable material.
- J. Granular Material: Soils classified as GW, GP, SW or SP by ASTM D 2487. Materials classified as GM and SM will be identified as granular only when fines have a plasticity index of zero.

- K. **Compaction:** The process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D1557 for general soil types or ASTM D 4253 or ASTM D 4254 for isolated cohesionless materials, abbreviated in this specification as "___percent maximum density."

1.3 LUMP SUM PRICE

- A. The items listed in the bid shall be considered as sufficient to complete the work in accordance with the drawings and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for the removing and replacing of topsoil and all excavating, filling, transporting of material, compaction, shaping, finishing, dressing, disposal of surplus material, testing, staking, construction supervision and all other work required for satisfactory completion of the grading operation. The building pad shall include all areas to 10 feet outside the building wall and the area under all footings including trench walls and bottom. Also included in this price shall be that necessary to complete the grubbing and root raking operation as required by this section and elsewhere.
- B. Base bids on the following criteria:
1. Surface elevations as indicated.
 2. No pipes or other man-made structures other than those indicated will be encountered. The utility locations shown are based on available information and are approximate and shall be field verified prior to beginning any work.
 3. The Geotechnical Report indicates the characteristics of unsuitable materials. Removal of these materials will be required as indicated in the Geotechnical Report and as required in this Section.
 4. Ground water elevations indicated are those existing at the time of subsurface investigations and do not necessarily represent ground water elevation at the time of construction.
 5. Borrow material in the quantities required are not available on site and must be developed and obtained by the Contractor.

1.4 UNIT PRICES

- A. Payment for the unit shown on the bid form shall be considered complete to cover the cost of all labor, material, equipment, testing and performing all operations necessary to complete the work in place. Payment shall be made based upon the actual quantity multiplied by the unit prices. Measurement will be made by means acceptable to the Owner and the Engineer. Direction to perform work must be given by the Owner and the Engineer.
- B. Material is to be paid for in its final position after placement or compaction by means acceptable to the Owner or Engineer. If actual amounts differ from the Base Bid quantities, the contract amount altered by change order at the unit price established on the bid form.
1. Removal of Unsuitable Materials and Replacement with Controlled Fill (per CY).
 - a. The Contractor shall provide a unit price (\$/CY) for removal of unsuitable materials.
 - b. The Contractor shall provide a unit price (\$/CY) for controlled fill material replacement.

1.5 SUBMITTALS

- A. Dewatering Plan: Submit plan that indicates the method proposed for removing collected water from open trenches and diverting surface water or piped flow away from work area. Include the following:
 - 1. Equipment and procedures for installing and operating the dewatering system indicated.
 - 2. Basic components of the proposed dewatering system and its planned method of operation.
 - 3. Record of performance and effectiveness of method or system in use.
 - 4. Comply with requirements identified in the paragraph entitled "Drainage and Dewatering"
- B. Shoring and Sheet piling Plan: Submit plan that describes the materials of the shoring system to be used. Include the following:
 - 1. Provide plans, sketches, or details along with calculations by a professional engineer.
 - 2. Indicate sequence and method of installation and removal.
 - 3. Indicate if components will remain after filling or backfilling.
- C. Certifications
 - 1. Independent Testing Laboratory
 - 2. Manufacturer or supplier certifications of compliance indicating conformance to this specification or the referenced standard(s) for the following:
 - a. Topsoil
 - b. Gravel
 - c. Sand
- D. Laboratory Testing: Submit test results as identified in the paragraph titled "Laboratory Testing" for any of the following materials to be used on the project. Obtain approval before any material is delivered to the site.
 - 1. Subgrade
 - 2. Common fill
 - 3. Controlled fill
 - 4. Granular fill
- E. Field Testing: Submit field test results as identified in the paragraph titled "Field Testing" for the following:
 - 1. Subgrade
 - 2. Excavation
 - 3. Fill/backfill

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store materials in a manner to prevent contamination or segregation. Do not stockpile materials in a manner or location that will cause excessive wetting or transporting of materials off-site or into storm drainage collection systems.

1.7 REGULATORY REQUIREMENTS

- A. Materials and workmanship specified herein with reference to SCDOT Standard Specifications for Highway Construction shall be in accordance with the referenced article or section of the standard except that contractual and payment provisions do not apply. Where the term "State" is used, it shall mean "Owner."
- B. Comply with Federal, State, and local regulations.
- C. Comply with the requirements of the land disturbance permit and stamped approved plans issued for this project by South Carolina Department of Health and Environmental Control (SCDHEC) and/or the MS4.

1.8 QUALITY ASSURANCE

- A. Materials: The Contractor will furnish the Engineer and Owner a description of all materials before ordering. The Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.
- B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.
- C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Owner and/or Engineer, a list of projects and the contacts who are familiar with his competence may be required to be submitted to verify experience.
- D. Design: Devices, equipment, structures, and systems not designed by the Engineer that the Contractor wishes to furnish shall be designed by either a registered professional engineer or by someone the Engineer accepts as qualified. Complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.
- E. Testing Agencies: Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test. Agencies to be used shall be submitted to the Engineer for review prior to engagement.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Provide materials free from debris, roots, wood, scrap materials, vegetable matter, refuse or frozen material. Maximum particle size permitted is 3 inches. Use excavated material from the site for the work indicated when material falls within the requirements specified herein. When materials available on site do not meet the quantity required nor the requirements specified herein, the Contractor shall obtain borrow materials from off-site.
 - 1. Common Fill: Provide a soil material from the site or borrow that can be readily compacted to the specified densities. Materials shall be unclassified. Soft, spongy, highly plastic, or otherwise unsuitable material is prohibited. Material shall be unclassified but shall contain sufficient fines to ensure proper compaction.
 - 2. Controlled Fill: Provide materials classified as GW, GP, GC, SW, SP, SM or SC by ASTM

D2487 where indicated.

- a. The liquid limit of such material shall not exceed 35% when tested in accordance with ASTM D4318.
 - b. The plasticity index shall not be greater than 12% when tested in accordance with ASTM D4318, and not more than 35% by weight shall be finer than the No. 200 sieve when tested in accordance with ASTM D1140.
 - c. Material shall be free from organics (less than 5% organics by weight) and have a standard proctor maximum dry density greater than 100 pcf.
3. Granular Fill: A dense, well graded aggregate mixture of sand, gravel or crushed stone mixed individually, in combination with each other, or with suitable binder soil. Granular fill may also consist of poorly graded sands or gravels.
 4. Gravel: Clean, coarsely graded natural gravel, crushed stone or a combination thereof classified as GW or GP in accordance with ASTM D2487 as indicated. The maximum particle size shall not exceed 3 inches
 5. Sand: Clean, coarse-grained sand classified as SW or SP by ASTM D2487 as indicated.
 6. Topsoil: Salvaged topsoil from stockpile created during stripping operations. Add necessary soil modifiers to bring material within the ranges specified in Table 1. Furnish additional topsoil meeting the requirements in Table 1 if stockpiled material is insufficient to complete the work indicated.
 7. Soil materials shall be free of subsoil, stumps, roots larger than 0.75 inch in diameter (with maximum 3% retained on the 0.25 inch sieve, brush, weeds, toxic substances, and other material or substance detrimental to plant growth.

TABLE 1

DOA SSIR Soil Survey Investigation Report No. 1, Laboratory Test for	Acceptable Limits
Sand Content	20 - 45 percent by weight
Silty Content	25 - 50 percent by weight
Clay Content	10 - 30 percent by weight
Organic Material (Walkley-Block)	5 percent
Ph	5.0 to 7.6
Soluble Salts	600 ppm maximum
Absorption Rate	0.5 inch per hour minimum

2.2 GEOTEXTILE FABRICS

A. Filter Fabric

1. Provide a pervious sheet of polyester, nylon, glass or polypropylene, ultraviolet resistant filaments woven, spun bonded, fused, or otherwise manufactured into a non-raveling fabric with uniform thickness and strength.
2. Fabric shall have the following manufacturer certified minimum average roll properties as determined by ASTM D4759:

TABLE 2: Minimum Average Roll Properties	Class A	Class B
Grab Tensile Strength (ASTM D4632) Machine and Transverse Direction	min. 180	80 lbs
Grab Elongation (ASTM D4632) Machine and Transverse Direction	min. 15	15 percent
Puncture Resistance (ASTM D4833)	min. 80	25 lbs.
Mullen Burst Strength (ASTM D3786)	min. 290	130 psi
Trapezoidal Tear (ASTM D4533)	min. 50	25 lbs
TABLE 2: Minimum Average Roll Properties	Class A	Class B
Apparent Opening Size:	See Criteria Below	
Soil with 50 percent or less particles by weight passing US No. 200 Sieve, AOS less than 0.6 mm (greater than #30 US Std. Sieve)		
Soil with more than 50 percent particles by weight passing US No. 200 Sieve, AOS less than 0.297 mm (greater than #50 US Std. Sieve)		
Permeability (ASTM D4491)	k fabric greater than k Soil	
Ultraviolet Degradation (ASTM D4355)	70 percent Strength	Retained at 150 hrs

PART 3 - EXECUTION

3.1 STRIPPING

- A. Perform clearing and grubbing operations as specified in SECTION "SITE CLEARING".
- B. Strip topsoil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Material unsuitable for use as topsoil may be used for common fill provided that those requirements are met. Locate topsoil so that material can be used readily for the finished grading. Protect and store in segregated piles until needed.

3.2 EXCAVATIONS

- A. Excavate to contours and dimensions indicated. Keep excavations free from water while construction is in progress. Notify the Engineer immediately in writing if it becomes necessary to remove rock, hard material, or other material defined as unsuitable to a depth greater than indicated. Refill excavations cut below the depths indicated with controlled fill and compact as specified herein. Excavate soil disturbed or weakened by construction operations or soils softened from exposure to weather. Refill with controlled fill or concrete and compact as specified herein.
- B. Excavations for Structures and Spread Footings
 1. Excavate to depth indicated. If excavation is deeper than indicated, then fill with concrete when the foundations or footings are placed or backfill with controlled fill material prior to placement of footings.
- C. Pile Supported Foundations
 1. Excavate to elevation of bottom of pile cap. Backfill and compact over excavations and

changes in grade due to pile driving operations in accordance with the requirements for filling and backfilling for structures. Place and compact backfill adjacent to pile caps in a manner that prevents displacement of the pile cap.

D. Disposal of Excavated Material

1. Surplus or other soil material not required or suitable for filling, backfilling, or embankment shall be removed from the property. Comply with all federal, state and local laws regarding the transportation and disposal of such material.
2. Dispose of excavated material in such a manner that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of facilities, or be detrimental to any property or work.

3.3 PREPARATION OF SUBGRADE

A. Subgrade Proof Rolling

1. Proof rolling shall be done in the presence of the Engineer. Notify the Engineer 72 hours prior to proof rolling.
2. After removal of topsoil or other overburden, proof roll the existing subgrade with six passes of a minimum 15 ton pneumatic-tired roller. Operate the roller in a systematic manner to assure the number of passes over all areas, and at speeds between 2.5 and 3.1 mph.
3. When proof rolling under structures, one-half of the passes made with the roller shall be in a direction perpendicular to the other passes.
4. Rutting or pumping shall indicate unsuitable material and that material shall be undercut as directed by the Engineer, to a depth of 24 inches, and replaced with the appropriate fill material. Unsuitable material removal shall be done in accordance with the paragraph titled "Excavations."
5. Perform proof rolling only when weather conditions permit. Do not proof roll wet or saturated subgrades. Materials degraded by proof rolling a wet or saturated subgrade shall be replaced by the Contractor as directed by the Engineer at no cost to the Owner.

B. Preparation of Subgrade

1. If discrepancies between this specification and the Report of Geotechnical Exploration by S&ME dated May 9, 2024 are found, the more strenuous requirement must be met or exceeded.
2. Scarify the underlying subgrade surface to a depth of 6 inches before the fill is started. Step, bench, or break up sloped surfaces steeper than one vertical to 4 horizontal so that the fill material will bond with or be securely keyed to the existing material. Scarify existing surface to a minimum depth of 6 inches if subgrade density is less than the degree of compaction specified and recompact.
3. When the subgrade is part fill and part excavation or natural ground, scarify the excavated or natural ground portion to a depth of 12 inches and recompact as specified for the adjacent or overlying fill. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.

C. Compaction of Subgrade

1. The subgrades shall be compacted to the following maximum densities:

Compaction of Subgrade Location	Percent Maximum Dry Density
Under sidewalks and grassed areas	95
Under building slabs, foundations, footings, pavements and base courses (Greater than 18 inches below bottom of structure or pavement)	95
Under building slabs, foundations, footings, pavements and base courses (Less than 18 inches below the bottom of structure or pavement)	98

2. Protect subgrade from excessive wheel loading during construction, including concrete trucks and dump trucks.
3. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in a manner that will comply with compaction requirements by use of a material equal to or better than best subgrade material on site.
4. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross section. Maintain subgrade for area to be paved and building pad subgrade, whether previously graded by others and accepted by Contractor or constructed by Contractor. Make adjustments that may be required in accordance with the Specifications at no additional expense to the Owner.

D. Tolerances

1. Grade to finished grades indicated within 0.10 foot. Grade area to drain water away from structures. Existing grades which are to remain but are disturbed by the Contractor's operations shall be restored to original condition.
2. Finish surface of subgrade to the elevation and cross section indicated. Finished surface shall be smooth and of uniform texture. Lightly scarify or blade the finished surface to bring the finished surface to within 0.10 foot of the indicated grade and to eliminate imprints made by compaction and shaping equipment. Surface shall show no deviations in excess of ½ inch when tested with a 10-foot straightedge.
3. Finished subgrade shall be verified to ensure proper elevation for construction above subgrade. Grading of building and pavement areas shall be checked by string line from grade stakes (blue tops) set at not more than 50' centers. Contractor is to provide engineering and field staking necessary for verification of lines, grades, and elevations.

3.4 FILL AND BACKFILL

- A. Place required fill and backfill material adjacent to structures and compact in a manner that prevents wedging action or eccentric loading upon or against the structures.
- B. Step or serrat slopes bounding or within areas to be filled or backfilled to prevent sliding of the fill.
- C. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction and slopes with the equipment used. Do not place material on surfaces that are muddy, frozen, or contain frost.
- D. Do not use equipment for filling or backfilling operations or for the formation of embankments against structures that will overload the structure. Filling or backfilling against structures will be done only after the structure has attained sufficient strength to withstand the loads anticipated during and after backfilling operations.

E. Fill and backfill operations shall be performed with the following materials:

1. Common Fill

- a. Construct fill backfill and embankment at the locations and to lines and grades indicated. Use only approved materials in constructing fill on the prepared subgrade. Place satisfactory material in horizontal lifts not exceeding 8 inches in loose depth. Do not place material on surfaces that are muddy, frozen, or contain frost. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction and slopes with the equipment used. Compact each lift as specified before placing the overlaying lift.

2. Controlled Fill

- a. Place controlled fill under footings, concrete slabs not pile supported, structures, pavements and where indicated in maximum loose lifts of 8 inches. Do not place material on surfaces that are muddy, frozen, or contain frost. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction and slopes with the equipment used. Compact each lift as specified herein before placing the overlaying lift. Compaction shall be accomplished continuously over the entire area. Sufficient passes shall be made to ensure that specified density is obtained.

3. Granular Fill, Gravel and Sand

- a. Granular fill, gravel and sand shall be placed where indicated. Do not dump material, but place in maximum loose 12-inch lifts and compact as indicated.

F. Compaction of Fill/Backfill

1. Fill and backfill shall be compacted to the following maximum densities:

Compaction of Fill / Backfill Location	Percent Maximum Dry Density
Under sidewalks and grassed areas	95
Under building slabs, foundations, footings, pavements and base courses (Greater than 18 inches below bottom of structure or pavement)	95
Under building slabs, foundations, footings, pavements and base courses (Less than 18 inches below the bottom of structure or pavement)	98

2. Fill shall be placed at a moisture content within 2% of its optimum moisture content.
3. Protect compacted fill from excessive wheel loading during construction, including concrete trucks and dump trucks. Remove areas of compacted fill found to have insufficient compaction density to depth necessary and replace in a manner that will comply with compaction requirements by use of a material meeting the specifications. Surface of compacted fill after compaction shall be hard, uniform, smooth, stable, and true to grade and cross section. Maintain compacted fill for area to be paved and building pad subgrade, whether previously graded by others and accepted by Contractor or constructed by Contractor. Make adjustments that may be required in accordance with the Specifications at no additional expense to the Owner.

G. Tolerances

1. Grade to finished grades indicated within 0.10 foot. Grade area to drain water away from structures. Existing grades which are to remain but are disturbed by the Contractor's operations shall be restored to original condition.
2. Finish surface of fill or backfill to the elevation and cross section indicated. Finished surface shall be smooth and of uniform texture. Lightly scarify or blade the finished surface to bring the finished surface to within 0.10 foot of the indicated grade and to eliminate imprints made by compaction and shaping equipment. Surface shall show no deviations in excess of ½ inch when tested with a 10-foot straightedge

3.5 TOPSOIL

- A. Clear areas to receive topsoil for the finished surface of materials that would interfere with planting and maintenance operations. Scarify subgrade to a depth of 2 inches. Do not place topsoil when the subgrade or fill is frozen, extremely wet or dry, or in other conditions detrimental to seeding, planting, or grading. Spread topsoil to a uniform depth of 4 inches over the designated areas.

3.6 PROTECTION

A. Shoring and Sheeting

1. The Contractor is responsible for the design of all shoring and sheeting systems. Provide shoring, bracing or sheeting where required. In addition to the requirements of Section 25 A and B of COE EM-385-1-1, and other requirements of this contract meet the following:
 - a. Prevent the undermining of pavements, foundations and slabs.
 - b. Slope banks where space permits.
 - c. Where shoring and sheeting materials remain in place in completed work to prevent settlements or damage to adjacent structures as directed, backfill the excavation to 3 feet below the finished grade and remove the remaining portion of the shoring before completing the backfill.

B. Drainage and Dewatering

1. Plan for and provide structures, equipment and construction for the collection and disposal of surface and subsurface water encountered during construction.
 - a. Drainage
 - 1) Dispose of surface water which may accumulate in open excavations, unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces.
 - 2) Surface dewatering plan shall include rerouting of any storm water runoff or natural drainage if necessary.
 - 3) Collect and dispose of surface and subsurface water encountered in the course of construction.
 - b. Dewatering
 - 1) Groundwater flowing toward or into excavations shall be controlled to prevent sloughing or excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction.
 - 2) French drains, sumps, ditches or trenches will not be permitted within three feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made.

- 3) Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in-situ material. While the excavation is open, the water level shall be maintained continuously, at least one foot below the working level.
- 4) Operate the dewatering system continuously, 24 hours per day, 7 days per week until construction work below existing water levels is complete. Have a back-up pump and system available for immediate use.

C. Erosion Control

1. Protect existing streams, ditches, and storm drain inlets from water-borne soil by the means indicated on the contract drawings and as required to prevent sedimentation of downstream features.

D. Existing Utilities

1. All known utility facilities are shown schematically on the plans and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown on plans will not relieve the Contractor of his responsibility under this requirement. "Existing Utilities Facilities" means any utility that exists on the project in its original, relocated or newly installed position. The Contractor will be held responsible for the cost of repairs to damaged underground facilities; even when such facilities are not shown on the plans.
2. The Contractor shall contact all utility companies prior to beginning work and request accurate field location of their respective utility lines.
3. Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

E. Structures and surfaces

1. Graded areas shall be protected from traffic, erosion, settlement, or any washing away that may occur from any cause prior to acceptance.
2. Any repair or reestablishment of final grades shall be made prior to final acceptance.

3.7 INSPECTION AND TESTING

A. Inspections

1. Notify the Owner, Project Representative and Engineer a minimum of 72 hours prior to all required observations, inspections or tests.
2. All work conducted and materials furnished shall be subject to review by the Engineer or the Project Representative. The Engineer will also have the right to require that any portion of the work be conducted in his presence.
 - a. If the work is covered after such instruction, it shall be exposed by the Contractor for observation.
 - b. However, if the Engineer is notified that such work is scheduled and the Engineer fails to appear within 72 hours, the Contractor may proceed without him.
3. All improper work shall be reconstructed and all materials which do not conform to the requirements of the specifications shall be removed from the work upon written notice.
4. The Engineer shall have the right to mark materials as rejected to distinguish them as such.

B. Testing

1. All testing shall be made at the Owner's expense. The Engineer shall approve test

- locations.
2. Notify the testing laboratory, Engineer, and Owner a minimum of 72 hours prior to all tests.
 3. Test results shall be furnished to the Contractor, Engineer and Owner within 72 hours after field tests are taken.
4. Laboratory testing
- a. Independent Testing laboratory shall operate in accordance with ASTM E 329 (latest edition) and shall be submitted to the engineer for approval.
 - b. Laboratory testing for maximum density and optimum moisture content shall be performed in accordance with ASTM D1557 for general soil types or ASTM D4253 or ASTM D4254 for isolated cohesionless materials.
 - c. Laboratory testing for mechanical analysis shall be performed in accordance with ASTM D2487.
 - d. Laboratory testing for plasticity index shall be performed in accordance with ASTM D4318
 - e. Frequency of laboratory testing
 - 1) Native soil subgrade: One maximum density, optimum moisture content, mechanical analysis and plasticity index test for each material encountered that will serve as subgrade.
 - 2) Fill/Backfill: One maximum density, optimum moisture content, mechanical analysis and plasticity index for each source and type of material to be used.
5. Field Testing
- a. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results.
 - b. If any test performed fails to meet these specifications, Independent Testing Laboratory shall immediately notify the Owner, Engineer and Contractor.
 - c. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that it may deem necessary. The Contractor shall provide free access to the site for testing activities.
 - d. Field density tests for in-place materials shall be performed in accordance with one of the following:
 - 1) Sand Cone Method: ASTM D 1556
 - 2) Balloon Method: ASTM D 2167
 - 3) Nuclear Method: ASTM D 6938
 - e. Frequency of field testing
 - 1) Subgrade
 - a) One test per 5,000 SF within building footprint (minimum of 3)
 - b) One test per 1,000 SY of pavement (minimum of 3)
 - c) One test per 250 LF of footing (minimum of 4 - one each face of building)
 - 2) Fill/Backfill
 - a) One test per 5,000 SF per lift within building footprint (minimum of 4 per lift)
 - b) One test per 1,000 SY of pavement per lift (minimum of 3 per lift)
 - c) One test per 250 LF of footing (minimum of 4 - one each face of building)

3.8 ACCEPTANCE

- A. If a tested material does not meet or exceed the specified requirements, the Contractor shall perform additional testing as directed by the Owner and/or Engineer to adequately define the limits of the material not meeting the specifications. Materials shall be re-tested to the satisfaction of the Owner and/or Engineer until specified requirements are met.
- B. All additional testing and work that is the result of a failed inspection or test shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 312000

SECTION 312010 - FILTER FABRIC

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all labor, equipment and services for the placement of silt fence, filter blanket protection under stone rip rap, as erosion control blanket for slope protection, and as a joint filter around all drainage pipe joints as shown on the drawings and as specified herein:

1.2 LUMP SUM PRICE

- A. The items listed in the bid shall be considered sufficient to complete the work in accordance with the drawings and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for all material, equipment, labor, testing, construction supervision and all other work required for satisfactory completion of filter fabric installation.

1.3 UNIT PRICES

- A. None this Section.

1.4 SUBMITTALS

- A. None this Section.

1.5 DELIVERY, STORAGE AND HANDLING

- A. During all periods of shipment and storage, the filter fabric shall be protected from direct sunlight, ultra-violet rays, temperatures greater than 140°F, mud, dirt, dust, and debris. The fabric shall be maintained, wrapped in a heavy-duty protective covering.

1.6 REGULATORY REQUIREMENTS

- A. Comply with Federal, State, and local regulations.
- B. Comply with the requirements of the land disturbance permit and stamped approved drawings issued for this project by South Carolina Department of Health and Environmental Control (SCDHEC) and/or the MS4.

1.7 QUALITY ASSURANCE

- A. Materials:

All material submittals shall be submitted by the contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.

- B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.
- C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Owner and/or Engineer, a list of projects and the contacts who are familiar with his competence may be required to be submitted to verify experience.

- D. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Silt Fence

1. Fabric: Fabric shall be a 3 foot wide, woven, geotextile filter fabric. Fabrics shall be included on SCDOT's Qualified Products Listing (QPL), approval sheet #34; and shall meet the requirements of the most current edition of the SCDOT Standard Specifications for Highway Construction and addendums.
2. Wire Backing: Woven wire fence shall be required as a backing for filter fabric with an elongation as determined by ASTM D1682 of 50% or greater. The wire fence shall be a minimum of 32 inches in width and shall have a minimum of 6 line wires with 12 inch stay spacing.
3. Posts - Steel: A minimum of 48 inches long, weigh a minimum of 1.3 lb/ft, and have projections for fastening the wire or the fabric to the post. Metal post shall have a metal plate securely attached such that when the post is driven to the proper depth, the plate will be below ground level for additional stability.

B. Filter Blanket

1. A non-woven heat bonded fiber of polypropylene and nylon filaments such as Mirafi-140 or equal. Filter blanket shall be used in the following situations:
 - a. Under stone rip rap.
 - b. For slope protection.
 - c. Pipe joint filter wrap.
 - d. Underdrains.

PART 3 - EXECUTION

3.1 SITE PREPARATION

- A. The surface to receive the fabric shall be prepared to a relatively smooth condition free of obstructions, depressions, debris and soft or low density pockets of material. The elevations and contours shown on the drawings shall be the final grade to the top of the stone rip rap.
- B. At the time of installation, the fabric shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation, or storage.
- C. The filter fabric shall be placed in a manner and at the locations shown on the drawings.

3.2 SILT FENCING

- A. Install silt fencing at locations shown on the drawings and as detailed on the drawings and as specified herein.
- B. Posts shall be installed to a minimum depth of 24 inches, with 1 to 2 inches protruding above the

top of the wire fence or fabric. In any case, no more than 3 feet of the post shall be above the ground. Post spacing shall be 10 feet when wire backing is used and 6 feet when wire backing is not used.

1. When wire backing is not required, fabric shall be attached to steel post using tie wires. The number and location of fasteners will be in a manner to prevent sagging or tearing of the fabric, but in all cases affixed to the post in no less than four places.
2. When woven wire is used, the wire will be attached to the post as described above and the filter fabric will be tied to the fence in such a manner to prevent sagging or tearing of the fabric.

3.3 FILTER BLANKET UNDER STONE RIP RAP and EROSION CONTROL BLANKET FOR SLOPE PROTECTION

- A. The fabric shall be placed on a smooth subgrade. The fabric is unrolled in overlapping strips with the long dimension running up the slope. The filter fabric shall be anchored in place with securing pins of the type recommended by the fabric manufacturer. Pins shall be placed on or within 1 foot of the centerline of the overlap. The fabric shall be placed so that the upstream strip will overlap the downstream strip. Maximum overlap is 3 feet. No traffic other than foot traffic will be allowed on the unprotected fabric. The fabric shall be loosely placed to avoid stretching and tearing during placement of stones.
- B. The fabric shall be protected at all times during construction from contamination by surface runoff. Contaminated fabric shall be removed and replaced with uncontaminated fabric. Any damage to the fabric during its installation and placement shall be replaced by the Contractor at no additional cost to the Owner. Any damaged fabric shall be covered with new fabric and shall have a minimum of 3 feet of overlap in all directions.
- C. Work shall be scheduled so that a layer of stone is immediately placed after fabric installation. Protect the fabric from damage from placement of the stone by limiting the drop height of the material.

3.4 PIPE JOINT FILTER WRAP

- A. A filter fabric shall be used to protect the joints of corrugated aluminum, concrete, and plastic pipe. After each joint is assembled, a minimum width of 4 feet of fabric shall be used to completely wrap each joint two times. The joint should be clean and free from debris. The fabric should be pulled tightly around the joint to prevent soil or debris from working its way into the joint.

3.5 PROTECTION

- A. Protect fabric from damage and displacement after installation. Damaged or displaced fabric shall be repaired or replaced at the contractor's expense.

3.6 INSPECTIONS

A. General

1. Notify the Owner, Project Representative and Engineer a minimum of 72 hours prior to all required observations, inspections or tests.
2. All work conducted and materials furnished shall be subject to review by the Engineer or the Project Representative. The Engineer will also have the right to require that any portion of the work be conducted in his presence.
 - a. If the work is covered after such instruction, it shall be exposed by the Contractor for observation.

- b. However, if the Engineer is notified that such work is scheduled and the Engineer fails to appear within 72 hours, the Contractor may proceed without him.
- 3. All improper work shall be reconstructed and all materials which do not conform to the requirements of the specifications shall be removed from the work upon written notice.
 - a. The Engineer shall have the right to mark materials as rejected to distinguish them as such.

B. Silt Fencing

- 1. Inspect silt fencing for general condition and buildup of sediment as indicated on the drawings.

3.7 ACCEPTANCE

- A. Final acceptance will be based on satisfactory placement of filter fabric as approved by the Owner and/or Engineer. Filter fabric shall be re-worked to the satisfaction of the Owner and/or Engineer until specified requirements are met.
- B. All additional work that is the result of a failed inspection shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 312010

SECTION 312523 - EROSION AND SEDIMENTATION CONTROLS

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes:

1. Installation of temporary and permanent erosion and sedimentation control systems.
2. Stormwater Pollution Prevention Plan (SWPPP) prepared by ADC Engineering, Inc.

1.2 REFERENCES

- A. South Carolina NPDES General Permit for Stormwater Discharges from Construction Activities (SCR100000)
- B. Horry County Stormwater Design Standards.

1.3 DEFINITIONS

- A. *Comprehensive* Stormwater Pollution Prevention Plan (C-SWPPP) - A Stormwater Pollution Prevention Plan (SWPPP) which is prepared to obtain coverage under the NPDES Construction General Permit (CGP). The C-SWPPP must be submitted with the Notice of Intent (NOI) application and must include an Engineering Report (project design calculations). This document must be submitted and approved by SCDHEC, regulated MS4 entity, or an approved entity with Permitting Authority prior to obtaining coverage under this permit.
- B. *On-Site* Stormwater Pollution Prevention Plan (OS-SWPPP) – The OS-SWPPP is a condensed version of the C-SWPPP and is stored on site. The OS-SWPPP does not include the Engineering Report (project design calculations). This document does not require submission or approval by the SCDHEC, regulated MS4 entity, or an approved entity with Permitting Authority prior to obtaining coverage under this permit.
- C. Best Management Practices (BMPs) - Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to Surface Waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control Site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. In order to effectively reduce erosion and sedimentation impacts, Best Management Practices (BMPs) must be designed, installed, and maintained during land disturbing activities.

1.4 OS-SWPPP

- A. The project specific OS-SWPPP is hereby incorporated as part of this specification and attached to this specification.
- B. The Contractor shall obtain approved / stamped plans from SCDHEC and/or the regulated MS4 entity upon approval of the silt fence installation.

1.5 SUBMITTALS

A. Product Data

1. Certifications: All supplied BMPs.

B. Quality Assurance / Quality Control Submittals

1. Design Data
2. Field Test Reports
3. Certificates
4. Manufacturer's Instructions / Field Reports
5. Qualification Statements

C. Closeout Submittals

1. Stormwater As-Built
2. Stormwater CCTV Videos. Refer to Section "Site Storm Drainage Utilities" for requirements.

1.6 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.
2. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the contacts who are familiar with his competence may be required to be submitted to verify experience.

B. Regulatory Requirements

1. Comply with federal, state, and local regulations.
2. Comply with the requirements of the stormwater / land disturbance permit and approved plans issued by South Carolina Department of Health and Environmental Control (SCDHEC) – Bureau of Water (BOW) and the MS4 (Horry County).

C. Certifications

1. Provide product certifications for all manufactured BMPs.

D. Pre-Construction Meetings

1. Prior to performing construction activities at the site, all contractors who will engage in land disturbing activities must attend and document attendance at a pre-construction meeting.
2. The contractor shall invite the Owner, Engineer, and agencies as indicated in the OS-SWPPP to the pre-construction meeting, a minimum of 7 days prior to conducting the meeting.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. During all periods of shipment and storage, the filter fabric shall be protected from direct sunlight, ultra-violet rays, temperatures greater than 140 degrees F., mud, dirt, dust, and debris. The fabric shall be maintained, wrapped in a heavy-duty protective covering.

B. Delivery

1. Seed: Protect from drying out and from contamination during delivery, on-site storage, and handling.
2. Fertilizer Delivery: Deliver to site in original, unopened containers bearing manufacturer's

chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer may be furnished in bulk with certificate indicating the above information.

PART 2 - PRODUCTS

2.1 SUMMARY

- A. All products shall be provided and installed in accordance with the OS-SWPPP. All materials, construction methods, testing, and approvals shall be in accordance with this document.

2.2 MATERIALS

- A. All erosion control products, sediment control devices and materials for non-stormwater BMPs as specified herein and on the Construction Drawings.

PART 3 - EXECUTION

3.1 SUMMARY

- A. All work shall be performed in accordance with the OS-SWPPP. All materials, construction methods, testing, and approvals shall be in accordance with this document.

3.2 PREPARATION

- A. Communicate SWPPP requirements, emphasizing construction sequence requirements, to Site Contractor, Erosion and Sediment Control Best Management Practice (BMP) installers, and all subcontractors working on-site.
- B. Install initial BMPs according to the sequence of construction in the SWPPP. Disturb only those areas absolutely necessary to install the initial BMPs. No other earth disturbance is permitted until after the Stormwater Pre-construction meeting.
- C. Inspect and certify the initial BMP installation with the AHJ and Engineer.

3.3 EROSION AND SEDIMENTATION CONTROL IMPLEMENTATION

- A. Place erosion and sediment control systems in accordance with the drawings and SWPPP or as may be dictated by site conditions in order to maintain the intent of the specifications and permits.
- B. The SWPPP and Construction Drawings shall be corrected, modified or updated as site conditions change. Contractor must obtain approval from the Engineer prior to any modification or substitution of specified Best Management Practices. All BMP changes (and references to approvals) shall be noted in the SWPPP and posted on the drawings. Construction Drawings should be updated daily to track progress when any of the following activities occur: BMP installation or modification, major construction (paving, storm sewer installation, footing installation, etc...), clearing, grubbing or grading, or temporary or permanent stabilization.
- C. Owner has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations and to direct Contractor to provide immediate permanent or temporary pollution control measures.

- D. Maintain erosion and sedimentation control systems as dictated by site conditions, indicated in the construction documents, or as directed by governing authorities or Owner to control sediment until final stabilization. Contractor shall respond to maintenance or additional work ordered by Owner or governing authorities immediately and in compliance with requirements of the applicable permit, and in no case may the initiation of a response exceed 24 hours. If governing authority requests changes to site BMPs or the SWPPP, ensure that changes are properly documented on the SWPPP Construction Drawings and notify the Engineer as to the request to determine if official SWPPP amendments are required.
- E. If, during the course of construction at a Site, the temporary removal or alteration of a BMP is necessary to accomplish the construction or to protect health and safety, the Project Superintendent shall note such removal or alteration on the Weekly Inspection Report Form, including specific information regarding the changes made and the day and time such changes were made. During the period the specified BMP is removed due to construction, the contractor must implement appropriate alternate BMPs at the end of each work day to serve a similar function to those BMPs temporarily removed. Contractor shall restore the original specified BMP as soon as practicable but in no case later than 24 hours after the completion of the activity that required the change. Contractor shall take all reasonable measures to prevent discharges from the Site to the waters of the United States during the time that the BMP has been altered or removed, including, but not necessarily limited to timing the removal or alteration of the BMP so that it occurs when precipitation is not forecasted and installing new or alternate BMPs outside the affected area.
- F. Contractor shall incorporate permanent erosion control features, paving, and vegetation establishment into project at earliest practicable time within approved sequence of construction to minimize need for temporary controls.

3.4 INSPECTIONS

- A. Notify the Owner, Project Representative and Engineer a minimum of 72 hours prior to all required observations, inspections or tests.
- B. All work conducted and materials furnished shall be subject to review by the Engineer or the Project Representative. The Engineer will also have the right to require that any portion of the work be conducted in his presence.
 - 1. If the work is covered after such instruction, it shall be exposed by the Contractor for observation.
 - 2. However, if the Engineer is notified that such work is scheduled and the Engineer fails to appear within 72 hours, the Contractor may proceed without him.
- C. All improper work shall be reconstructed and all materials which do not conform to the requirements of the specifications shall be removed from the work upon written notice.
 - 1. The Engineer shall have the right to mark materials as rejected to distinguish them as such.
- D. Inspections shall be in accordance with the OS-SWPPP and drawings.

END OF SECTION 312523

Comprehensive Stormwater Pollution Prevention Plan (C-SWPPP) For Construction Activities

Finklea Firestation #6

SC Hwy 9 Business and Fleetwood Road, Loris, SC

July 3, 2024

Project/Site Name:	Primary Permittee:
Finklea Firestation #6	Horry County
Project TMS/PIN:	Permittee/Owner Contact:
PIN: 156-12-02-0008	1301 2 nd Ave. Conway, SC 29576 843-915-5300 Barnhillj@horrycountysc.gov
SWPPP Preparer:	Day-to-Day Operator:
Diamond Shores Surveying, LLC Kyle R. Nobles, P.E. 315 Main Street # 11 Conway, SC 29526 843-488-1739 kyle@diamondshores.net	John Barnhill 1301 2 nd Ave. Conway, SC 29576 843-915-5300 Barnhillj@horrycountysc.gov

Modification Dates:

Modification I: ____/____/____

Modification II: ____/____/____

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SECTION 1. Project Overview

1.1 Narrative (CGP Section 3.2.1)

Construction Activities and BMP Summary

Finklea Fire Station #6 is a 3.40-acre commercial property. The project is located at SC Hwy 9 Business and Fleetwood Road in Loris, PIN numbers 156-12-02-0008.

The proposed 3.40-acre development involves disturbing 2.74 acres of land for a Fire Station, grading existing contours, constructing one commercial building, three proposed driveways, one proposed retention pond, 18 parking spaces, and utilities to meet the parcel's final specifications. Before starting construction, a silt fence will be built around the entire property.

The Construction activities at this site will be implemented in 3 distinct Erosion Prevention and Sediment Control Phases. The first phase includes the initial installation of perimeter controls, sediment control BMPs, and the construction entrance. The second phase includes the bulk of the construction activities and the implementation of internal storm water management BMPs. The final phase, phase 3, includes the final stabilization of the site.

Pre-Development Conditions

The 3.40-acre parcel is currently cleared and vacant. In its pre-development state, the stormwater drains into an existing ditch on the southeast corner of the property. That ditch crosses Fleetwood Road and eventually reaches Rooty Branch.

Figure 1: Pre-Development Conditions. The Pre-Development Map can be found in Appendix B.

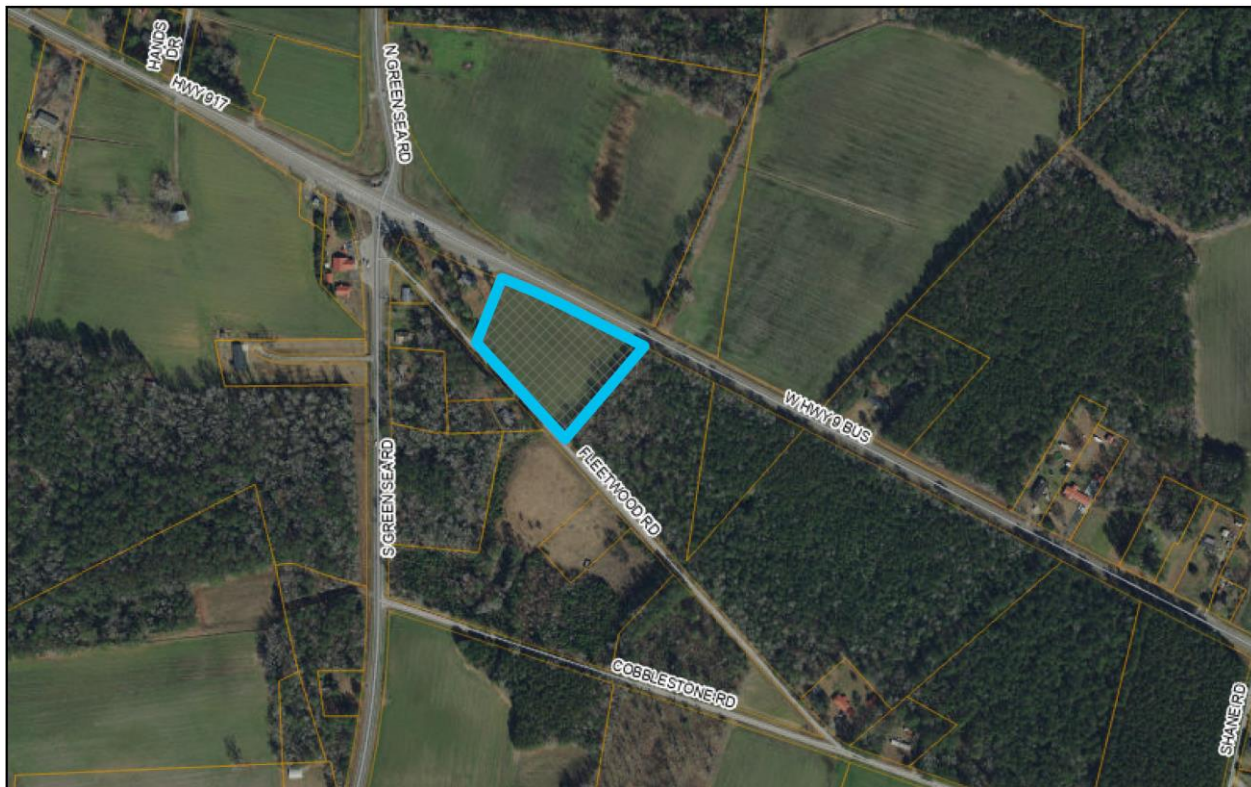


Figure 1: Pre-Development Conditions (Horry County GIS)

Post-Development Conditions

In its post-development state, the project involves disturbing 2.74 acres of land for a Fire Station, grading existing contours, constructing one commercial building, three proposed driveways, one proposed retention pond, 18 parking spaces, and utilities to meet the parcel's final specifications. The stormwater drains into an existing ditch on the southeast corner of the property. That ditch crosses Fleetwood Road and eventually reaches Rooty Branch. The Post Development Drainage Map can be found in Appendix B.

Flooding Issues

See **Appendix A** of the SWPPP report for the currently adopted FIRM Map, this site currently does not have any flooding issues upstream, downstream, or within this project.

Residential Subdivision Information

This C-SWPPP was developed for the Primary Permittee, Horry County. This C-SWPPP may be used by Secondary Permittee to obtain coverage.

1.2 Stormwater Management and Sediment Control (CGP Section 3.2.2)

Erosion Prevention BMPs

As the existing site is cleared, grubbed, and graded to the proposed contours shown on the construction site plans, erosion prevention BMPs shall be placed throughout the construction site to aid in the prevention of sediment-laden stormwater runoff. These BMPs shall be focused in areas with high potential of erosion, areas preceding infiltration practices, and shall be applied to all steep slopes. That is slopes equal to or greater than **3H:1V**.

Each erosion prevention measure shall be selected on a site-specific basis and details have been provided on the construction site plans. The plans identify all proposed Erosion Prevention BMPs and the recommended installation, maintenance, and inspection procedures.

Examples of Erosion Prevention BMPs are, but are not limited to, surface roughening, temporary seeding, erosion control blankets, turf reinforcement mats, sodding, riprap, outlet protection, dust control, and polyacrylamide (PAM). Information on the design and proper use of Erosion Prevention BMPs can be located in the [SC DHEC's BMP Handbook](#)

Sediment Control BMPs

Sediment Control BMPs are designed to remove some of the sediment accumulated within stormwater runoff, to the best extent practicable. These BMPs help prevent sediment impacts to adjacent properties and water bodies from stormwater discharges originating from construction sites.

Typically, these BMPs are placed near each of the site's outfalls and are installed prior to clearing and grubbing of the site (before large areas of soil are exposed). However, these BMPs can also be located throughout the construction site and, in these circumstances, are installed after mass grading has occurred. Placement, sizing, and modifications of Sediment Control BMPs should be left to the SWPPP preparer and/or the Site Engineer. **Contractors must consult the SWPPP Preparer as listed at the front of this SWPPP before making any significant changes to these BMPs.**

Each sediment control BMP shall be selected on a site-specific basis. Examples of Sediment Control BMPs are, but are not limited to sediment traps, sediment basins, silt fence, rock check dams, rock sediment dikes, sediment tubes, and inlet protection. Please consult [SC DHEC's BMP Handbook](#) for more information on Sediment Control BMPs.

Structural Control BMPs and Floodplain Placement

This site-specific SWPPP utilizes the following structural control BMPs: **Detention Pond** These practices have been designed to either divert flows from exposed soils to retain/detain flows, and to otherwise limit the runoff and the discharge of pollutants from disturbed areas of the construction site.

Throughout the lifespan of the construction project these BMPs will be installed and maintained, as required by the SWPPP and the construction site plans, until final stabilization has been achieved for the areas draining to each BMP. Upon final stabilization, each structural control BMP must be modified to the post-construction conditions shown within the approved construction site plans or removed, if the structural BMP was a temporary structure.

Any Structural Control BMPs that are being proposed within the 100-yr floodplains will require approval from the local regulating agency, since SC DHEC does not have the authority to regulate within the associated flood plains. Approvals from the local agency will be in **Appendix C, Additional Approvals/Certifications** of this SWPPP. If the required approval is not located in this SWPPP, please contact the Primary Permittee listed on the title sheet of this SWPPP before performing work within the floodplain.

Construction Entrances and Dust Control

All access areas into and out of the limits of disturbance, as shown on the construction site plans, are required to be equipped with a construction entrance. The use of this BMP will limit the amount of sediment being transported by construction vehicles onto existing roadways or other impervious areas. Any tracked sediment, along with any attached pollutants, deposited on impervious areas could be washed downstream during the next rain event. Each construction entrance must be installed as shown in the details section of the construction site plans.

If a new entrance or exit is required, that is not shown on the plans, install the construction entrance as noted by the construction entrance detail, mark the location on the plans and make a record of this minor modification in the SWPPP's modification log, which is located within one of the appendices of the On-site SWPPP.

Each stabilized construction entrance should be used in conjunction with Street Sweeping measures if it becomes apparent that sediment is still being tracked onto adjacent impervious areas, even with the use of the construction entrance.

During extremely dry conditions, drought, and/or excessive winds, the construction site should be treated for dust control to prevent the suspension of fine sediment particles into the air, being carried offsite, and deposited on adjacent properties or surface waters. This practice may not be directly called out for on the construction site plans. A water tanker used to spray the soil down may be an effective way to prevent excessive dust at a construction site.

Water Quality BMPs During Construction

Site-specific water quality BMPs (e.g., sediment basins, sediment traps, rock check dams, and rock sediment dikes) must be installed prior to the mass clearing, grubbing, and grading of the site, and must be kept in functioning order throughout the lifespan of all construction activities. Each of these BMPs must be maintained and inspected until all areas draining to these BMPs have reached final stabilization, approved by the construction site inspector or the SWPPP Preparer, and recorded within the stabilization log located as an appendix of the On-site SWPPP.

The location, installation procedures, and maintenance procedures for each water quality BMP can be found within the approved construction site plans.

Post-Construction Water Quality

All construction sites disturbing 5 acres or more, including construction activities associated with Larger Common Plans disturbing 5 acres or more (for sites located within an MS4 this may be 1 acre or more), must be designed to treat water quality post-construction. These water quality controls must be installed and stabilized prior to terminating coverage under the CGP.

Stormwater Pollution Prevention Plan
For the Construction General Permit (SCR100000)

These controls will require routine maintenance to remain functional; this is to be conducted by the Primary Permittee or the entity that accepts responsibility for these structures once construction has been completed. Additional information, including permanent maintenance and inspection procedures, can be found in **Appendix C** of the OS-SWPPP or within the construction site plans.

Upon final stabilization, each construction site will have to make the transition from temporary BMPs to permanent BMPs. This transition may include the conversion of a sediment basin to a detention basin, a sediment trap to a bioretention area, or diversion swales to permanently vegetated swales. All post-construction (permanent) water quality and water quantity BMPs are identified in the final phase of the Erosion and Sediment Control located within the construction site plans.

Other Stormwater Management Procedures

Based on the nature, conditions, and/or procedures associated with this construction site, the following items must be followed and adopted by all those conducting land disturbing activities at this site:

- All construction debris must be stockpiled in designated areas, which have been provided with the proper BMPs to prevent the discharge of pollutants through stormwater runoff from buildings or other similar materials off-site or into surface waters.
- Any additional waste material or stockpile material (i.e., soil and mulch) must also be stored in the designated areas as shown on the Construction Site Plans or as the contractor responsible for day-day activities at this site deems appropriate. Silt fence or an approved equal shall surround all stockpiled materials.
- All parties conducting work at this construction site must be informed of and make note of pollutant sources, both industrial and construction, at this site, and be informed of all controls and measures that will be implemented to prevent the discharge of these pollutants in stormwater runoff.
- Any additional non-stormwater discharges, as referenced in the CGP, should be eliminated, or reduced to the maximum extent feasible. All unpreventable non-stormwater discharges shall be treated through the approved stormwater management system before releasing off-site. Following is a list of allowable non-stormwater discharges:
 - Fire hydrant flushing
 - Wash water without detergents
 - Water used for dust control.
 - Potable water
 - Building wash down water without detergents
 - Uncontaminated pavement wash water
 - Uncontaminated condensation from mechanical equipment
 - Uncontaminated ground or spring water
 - Water from foundation of footing drains
 - Uncontaminated excavation dewatering
 - Landscape irrigation.

1.3 Sequence of Construction

The construction sequence for this project has been provided for the proposed construction activities and can be found on construction site plans on the following sheets.

Sheet 4.1	SWPPP-Erosion Control-Initial Phase
Sheet 4.1	SWPPP- Erosion Control-Intermediate Phase
Sheet 4.1	SWPPP-Erosion Control-Final Phase
Sheet 4.2	SWPPP-Erosion Control Legends
Sheet 4.3	SWPPP-Erosion Control Details

For additional information or questions on the sequencing please contact the SWPPP Preparer or the Permittee referenced on the cover of this SWPPP.

1.4 Non-Numeric Effluent Limits

Stormwater Volume and Velocity Control

During the implementation of construction activities, all parties performing work at this construction site whose work may affect the implementation of the SWPPP must be informed of and directed on how to comply with this Non-Numeric Effluent Limit, which requires the management of stormwater runoff within the construction site and at each outfall. The purpose of this requirement is to control the stormwater volume and velocity at these locations to minimize erosion.

Specifically, each responsible party should be made aware of the practices that have been or should be implemented at the construction site to accomplish these stormwater management practices. Below is a list of practices that may be utilized within the disturbed area and at each outfall at construction sites to control stormwater volume and velocity:

Volume Control

- Limiting the amount of disturbed area and exposed soils
- Staging and/or Phasing of the Construction Sequence;
- Sediment Basins and Sediment Traps
- Diverting off-site flow around the construction site;
- Controlling the Drainage Patterns within the Construction Site;
- Temporary Stabilization of Disturbed Areas.

Velocity Control

- Surface Roughening and/or other Slope Stabilization Practices;
- Level Spreaders, Riprap Plunge Pools and/or other Velocity Dissipation BMPS located at the Construction Site's and Sediment Basin Outfalls.
- Use of Rock Checks, Sediment Tubes, Etc. in Temporary Diversions Swales and Ditches.
- Use of Erosion Control Blankets, Turf Reinforcement Mats, and other Non-Vegetative BMPs that can be used to Quickly Stabilize Disturbed Areas.

The SWPPP Preparer/Engineer should approve any modifications (Additional BMPs or Changes to Existing BMPs) to address the management of stormwater volume and velocity prior to implementation. All approved SWPPPs that were issued coverage under the CGP should include ample BMPs and other control measures to address this specific Non-Numeric Effluent Limit.

Soil Exposure, Compaction and Preservation

Throughout construction activities, the amount of soil exposed during construction should be kept to a minimum. This may be accomplished by minimizing the amount the disturbed area within the permitted Limits of Disturbance (shown on the approved construction site plans) to only that which is necessary to complete the proposed work. For areas that have already been disturbed and where construction activities will not begin for a period of 14 days or more, temporary stabilization techniques must be implemented.

Prior to implementation of any major grading activities, topsoil is to be preserved by placing it in areas designated for stockpiling until final grades are reached. Each stockpile must be equipped with proper sediment and erosion controls to preserve the topsoil and protect adjacent areas from impacts. Once final grades have been reached, the preserved topsoil should be utilized to apply to areas identified for stabilization. Topsoil contains nutrients and organisms that aid in the growth of vegetation.

The **Compaction of Soil** should also be minimized to the degree practicable during grading activities. This is especially important during the replacement of topsoil to aid in the quick establishment of vegetative cover. Compaction of soil may also reduce rainfall's ability to infiltrate into the soil, increasing the amount of stormwater runoff.

Soil Stabilization

Throughout construction activities, soil stabilization techniques are to be initiated as soon as practicable whenever any clearing, grading, excavating, or other land-disturbing activities have permanently or temporarily ceased on any portion of the construction site and will not resume for a period exceeding 14 calendar days. For areas where initiating stabilization measures is infeasible, (e.g., where snow cover, frozen ground, or drought conditions preclude stabilization), initiate vegetative or non-vegetative stabilization measures as soon as practicable.

Steep Slopes (Slopes of 30% grade or greater)

All disturbed steep slopes (30% grade, ~3H:1V, or greater), and steep slopes to be created through grading activities must be managed in a fashion that limits the potential of erosion along the slopes. All parties whose work is/was responsible for the creation/disturbance of steep slopes must comply with the following items:

- **Minimize the Disturbance** of all steep slopes, when possible.
- **Divert Concentrated or Channelized Flows** of stormwater away from and around steep slope disturbances.
- **Use Specialized BMP Controls** including temporary and permanent seeding with soil binders, erosion control blankets, surface roughening, reducing continuous slope length with terracing or diversions, gradient terraces, interceptor dikes and swales, grass-lined channels, pipe slope drains, subsurface drains, level spreaders, check dams, seep berms, and triangular silt dikes to minimize erosion.
- **Initiate Stabilization Measures** as soon as practicable on any disturbed steep slope areas where construction activities have permanently or temporarily ceased and will not resume for a period exceeding 7 calendar days.
- **A Vegetative and/or Non-Vegetative Cover** must be established within 3 working days from the time that stabilization measures were initiated.

Stabilization of steep slopes should be a priority for those performing work at the construction site. At the very least, runoff control BMPs should be implemented to transport stormwater runoff from the top of the slope to the toe of the slope. An example of this is to install diversion swales along the top of slope and direct the runoff towards pipe slopes drains to transport the runoff to the toe of the slope. All pipe slopes drain outlets are to be equipped with proper outlet protection.

Sediment Discharge Minimization

Permittees, Contractors, and all other parties responsible for conducting land-disturbing activities are required to install and maintain all erosion and sediment BMPs that are identified on the approved construction site plans. These BMPs have been designed and approved to address such factors as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soils particle sizes expected to be present on the construction site. **Proper installation, inspection, and maintenance will allow these BMPs to operate at maximum efficiencies in order to minimize sediment discharges to the maximum extent practical.**

Pollutant Discharge Minimization

Permittees, Contractors, and all other parties responsible for conducting land-disturbing activities are required to install, implement, and maintain effective pollution prevention measures to minimize the discharge of pollutants. At a minimum, the following items must be implemented:

- **Minimize the discharge of pollutants from dewatering trenches and excavations** by managing runoff with the appropriate controls. Otherwise, these discharges are prohibited.
- **Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters.** Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge.
- **Minimize the exposure of building materials, building products, construction wastes, trash,** landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on the site to precipitation and to stormwater; and
- **Minimize the discharge of pollutants from spills and leaks** and implement chemical spill and leak prevention and response

procedures.

Prohibited Discharges

Permittees, Contractors, and all other responsible parties for conducting land-disturbing activities are prohibited to discharges, from the construction site, the following items:

- Wastewater from washout of concrete, unless managed by an appropriate control;
- Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;
- Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and
- Soaps or solvents used in vehicle and equipment washing.

1.5 Buffer Zone Management

Buffer Zone Information

Compliance Option C was selected since **the pre-existing development** has stripped the buffer zone area from natural strands of vegetation. **The pre-existing state of the project area was mowed and maintained grassed area that extended to within a few feet of the surface waters.** For this reason, a buffer zone will not be provided as allowed through Compliance Option C listed in Section 3.2.4.C of the CGP.

In lieu of a buffer zone, all sediment control BMPs discharging to **this tributary** have been designed to meet an 80% trapping efficiency to prevent impacts to this surface water. Supporting Calculations demonstrating these trapping efficiencies can be found in **Appendix D (SWR)** of this SWPPP.

All perimeter BMPs and sediment control BMPs, as on S&E-1 of the construction site plans, are to be installed prior to the discharge of stormwater runoff into the adjacent surface water from disturbed areas. Inspection and maintenance of these BMPs are to be conducted until final stabilization is reached. All maintenance procedures and inspection requirements for these BMPs can be found within the S&E Plan Set.

Additional Buffer Zone Information

All construction sites that contain or are adjacent to surface waters must provide a vegetated buffer of at least 30 linear feet, or 45 linear feet when the surface water is classified as a Sensitive Waters (Section 3.2.4.C of South Carolina's CGP). This requirement is only applicable during construction. Work may be conducted within the buffer area once all disturbed areas discharging towards the buffer zone have had final stabilization measures implemented. This work must have been included within the SWPPP at the time of coverage approval.

Buffer Zones Requirements should be explained in detail during the Pre-Construction Conference. These details should include the outlining of the exact location of where the buffer starts and ends, the sediment and erosion controls precluding the buffer and all other general information pertinent to maintaining the buffer zone area during construction.

All contractors and sub-contractors shall be made aware of the buffer zones and establish a work procedure that preserves and protects these areas. The buffer zones should be flagged prior to any perimeter control placement and, most importantly, before mass clearing and grubbing. These areas must also be inspected during construction for areas of excessive sediment impacts, which may need to be removed if sediment impacts are evident within the buffer zone.

In the event that a portion of a buffer is accidentally disturbed, the contractor shall temporarily stabilize the area as soon as possible and consult with the construction site's inspector, permittee, and/or engineer on the installation of any additional sediment control or erosion prevention measure to protect the portion of the buffer still undisturbed.

1.6 Certification Statement

"I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000."

Name: Kyle R. Nobles

Title: Engineer

Date: 07.03.2024



(Signature and Seal)

SECTION 2. Site Features & Sensitive Areas

2.1 Sources of Pollution

Throughout construction activities, each permittee, contractor, and person responsible for conducting work will need to ensure that sources of pollution are managed to prevent their discharge from the construction site. Expected pollution sources during construction have been identified in **Table 1**, but due to the nature of construction activities, it is often tough to predict all pollution sources that may appear throughout the life of a construction project. For that reason, the following table has also been provided to help all those performing work at this construction site identify possible sources of pollution.

Stormwater runoff subjected to the identified pollution sources must be treated by the appropriate BMPs as directed by this SWPPP.

In the event that any additional sources of pollution are identified during construction, the person(s) with day-to-day operational control at the site is to add the new source(s) to **Table 1: Potential Sources of Pollution** and consult with the SWPPP Preparer to properly address this source and to prevent the discharge of its pollutant through stormwater runoff.

Source	Material or Chemical	Location	Appropriate Control Measures
Loose soil exposed/disturbed during clearing, grubbing and grading activities	Sediment	All areas within the Limits of Disturbance	As directed by the construction Plans. This includes Silt Fence, sediment tubes, sediment basins, and sediment traps.
Areas where construction equipment are cleaned, a.k.a. concrete washout	Heavy Metals & pH	Located adjacent to each construction entrance	Concrete Washout Basin
Water encountered during trenching	Nutrients & Sediment	In and around any trenching activities.	Direct water into impoundments such as basins or traps to allow for the sedimentation of the listed pollutants.
Paving Operations	Sediment & Trash	All areas need to be paved.	Inlet protection.
Material Delivery and Storage Areas	Nutrients, pH, Sediment, Heavy Metals, oils & grease	All areas used as storage areas	Silt fence and/or sediment dikes
Equipment fueling and maintenance areas	Metals, hydrocarbons, oils and greases	Areas surrounding fuel tanks	Provide secondary containments, located in upland areas. Repair leaking and broken hoses.
Paints	Metal oxides, stoddard solvent, talc, calcium-carbonate, arsenic	Throughout site, primarily in areas of building construction	Washwater should be contained and is prohibited from being discharged

Table 1: Potential Sources of Pollution

2.2 Surface Waters

The stormwater drains into an existing ditch on the southeast corner of the property. That ditch crosses Fleetwood Road and eventually reaches Rooty Branch

2.3 Impairments and TMDLs

This construction site's discharges drain into WoS that DOES NOT have an established TMDL for the following impairment (s).

D. Impaired Waterbodies Information (Attach additional sheet(s) as needed)

1. 303(d) Listed Impaired Waterbodies					
a. Name of Nearest DHEC Water Quality Monitoring Stations (WQMS)(s) that receives stormwater from your construction site and/or thru an MS4 and the Name of the Corresponding Waterbody?		b. Is this WQMS(s) listed on the <u>most current</u> 303(d) List? If <u>No</u> , proceed to Section 2 of this table. If <u>Yes</u> , complete items c thru f.	c. List the pollutant(s) identified as "CAUSES" of the impairment	d. Will any pollutants causing the impairment be present in your site's construction stormwater discharges?	e. If <u>yes</u> for d, list the "USE SUPPORT" impairment(s) affected by the pollutant(s) identified in c.
Nearest DHEC WQMS(s)	Corresponding Waterbody				
RS-13111	Prince Mill Swamp	☒ Yes ☐ No	E Coli	☐ Yes ☒ No	
PD-176	Hughes Lake	☒ Yes ☐ No	E.Coli	☐ Yes ☒ No	
PD-619	Little Pee Dee River	☒ Yes ☐ No	HG	☐ Yes ☒ No	
f. If <u>yes</u> for d above, will use of the BMPs proposed for your project ensure the site's discharges will <u>NOT</u> contribute to or cause further WQS violations for the impairment(s) listed in c? ☐ Yes ☐ No (NOTE: If <u>no</u> for f, this site is NOT eligible for coverage under the CGP). See Instructions.					
2. TMDL Impaired Waterbodies					
a. Name of Nearest DHEC Water Quality Monitoring Stations (WQMS)(s) that receives stormwater from your construction site and/or thru an MS4?	b. Has a TMDL(s) been developed for this WQMS(s)? If <u>No</u> , identify as such below and proceed to Section VI. If <u>Yes</u> , complete items c thru f of this table.	c. If <u>yes</u> for b, what pollutants are listed as "CAUSES" or causing the impairment?	d. If <u>yes</u> for b, has the standard been "ATTAINED" or "Fully Supported" for the impairment(s)?	e. If <u>no</u> for d (Not Attained), will any pollutants causing the impairment be present in your site's construction stormwater discharges?	
RS-13111	☐ Yes ☒ No		☒ Yes ☐ No	☐ Yes ☐ No	
PD-176	☐ Yes ☒ No		☒ Yes ☐ No	☐ Yes ☐ No	
PD-619	☐ Yes ☒ No		☐ Yes ☐ No	☐ Yes ☐ No	
f. If <u>yes</u> for e above, are your discharges consistent with the assumptions and requirements of the TMDL(s)? ☐ Yes ☐ No (NOTE: If <u>no</u> for f, this site is NOT eligible for coverage under the CGP). See Instructions.					

2.4 Critical Areas (CZC only)

The project site is located within and/or directly adjacent to any Critical Areas including coastal waters, tidelands, beaches, or beach/dune systems.

SECTION 3. Compliance Requirements

3.1 SWPPP Availability

A copy of the On-Site SWPPP (OS-SWPPP), NOI and CGP Coverage letter from DHEC must be retained on-site. If an on-site location is unavailable to store the OS-SWPPP, when no personnel are present, notice of the plan's location must be posted near the main entrance. The OS-SWPPP should be kept at a location available to entities having compliance-related responsibilities. OS-SWPPP must be made available upon request by EPA, DHEC, Delegated Local Entity (72-300), Local Government acting as Operator of Municipal Separate Storm Sewer System (MS4). The OS-SWPPP is also digitally available upon request from amanda@diamondshores.net.

3.2 Pre-Construction Conferences

A Pre-Construction Conference will be held via video conference and must be attended by the Owner, Contractor, and Engineer. The purpose of the Pre-Construction Conference is to go over the OS-SWPPP, including the Construction Site Plans, and any other applicable requirements of the permit at the site.

3.3 Inspection Requirements

Pursuant to SCDHEC requirements, the site will be inspected by a CEPSCI certified inspector every 7 calendars days or within 24 hours after a rain event that exceeds 0.5 inches. Once the site has achieved temporary stabilization, the inspections can be reduced to a monthly inspection provided that no disturbances occur in those areas. Inspection reports will be stored at the office of the Engineer. DHEC may require inspections on a more frequent basis if instructed.

3.4 Maintenance Requirements

SC-DHEC requires all BMPs identified in OS-SWPPP must be maintained and effective operating conditions. If the site inspections identify BMPS not operating effectively, maintenance must be performed.

1. Within 7 Calendar days,
2. Before the next inspection or as reasonably possible.
3. Before next storm event whenever practicable

3.5 Record Keeping

All required record documentation is included in the following Appendices of this document:

Appendix E: Inspection Log & Reports

Appendix F: Rainfall Log & Reports

Appendix G: Additional Site Logs and Records

Appendix H: Construction General Permit.

3.6 Final Stabilization

The site will be stabilized through permanent seeding and a Notice of Termination will be submitted upon final stabilization.

Appendix A

Site Maps

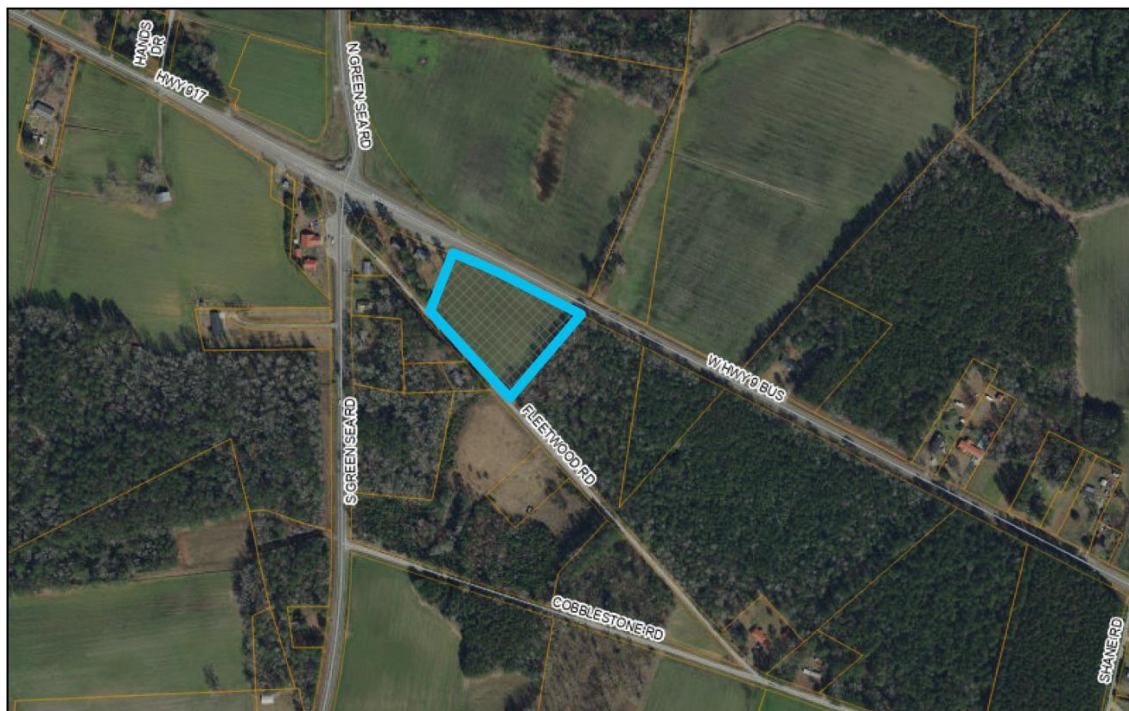
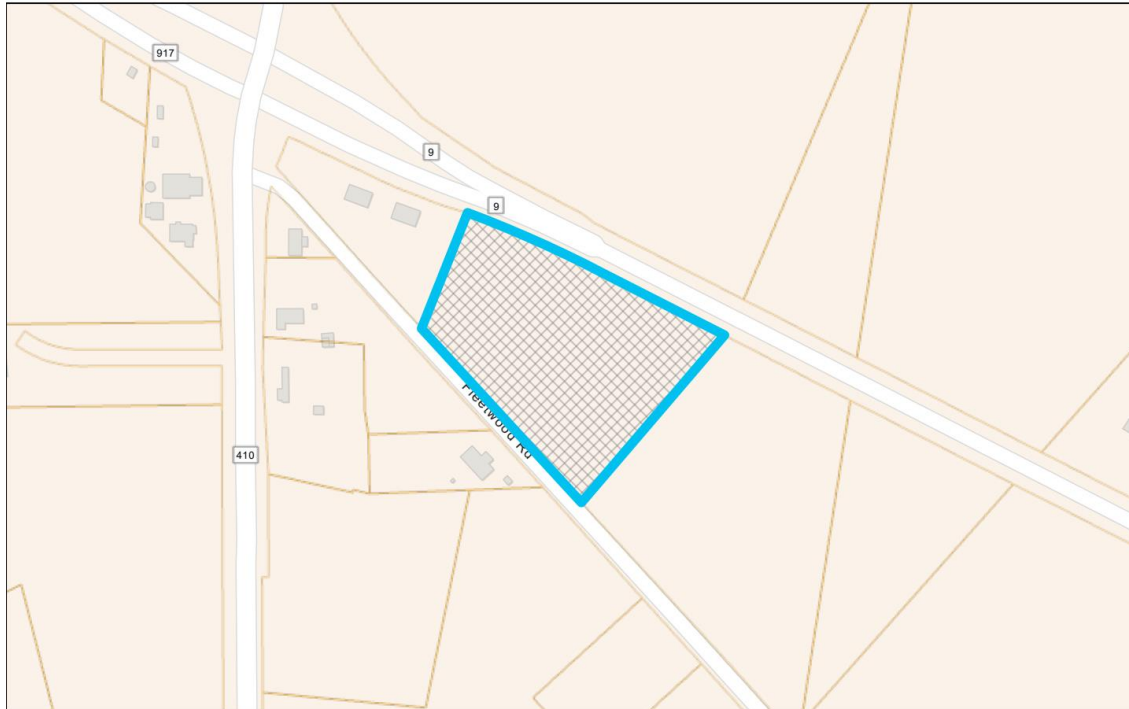
1. Horry County GIS Map
2. Soils Map
3. FEMA Flood Map

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Horry County GIS Map



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Soils Map



Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
GoA	Goldsboro loamy fine sand, 0 to 2 percent slopes	B	2.4	76.3%
Ln	Lynchburg loamy fine sand	B/D	0.7	22.5%
Wo	Woodington fine sandy loam	A/D	0.0	1.2%
Totals for Area of Interest			3.1	100.0%

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Stormwater Pollution Prevention Plan For the Construction General Permit (SCR100000)

MAP LEGEND

- Area of Interest (AOI)**

 - Area of Interest (AOI)

Soils

 - Soil Survey Areas

Soil Rating Polygons

 - A
 - A/D
 - B
 - B/D
 - C
 - C/D
 - D
 - Not rated or not available

Soil Rating Lines

 - A
 - A/D
 - B
 - B/D
 - C
 - C/D
 - D
 - Not rated or not available

Soil Rating Points

 - A
 - A/D
 - B

Water Features

 - Streams and Canals

Transportation

 - Rails
 - Interstate Highways
 - US Routes
 - Major Roads
 - Local Roads

Background

 - Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Horry County, South Carolina
Survey Area Data: Version 26, Sep 6, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 11, 2022—May 15, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

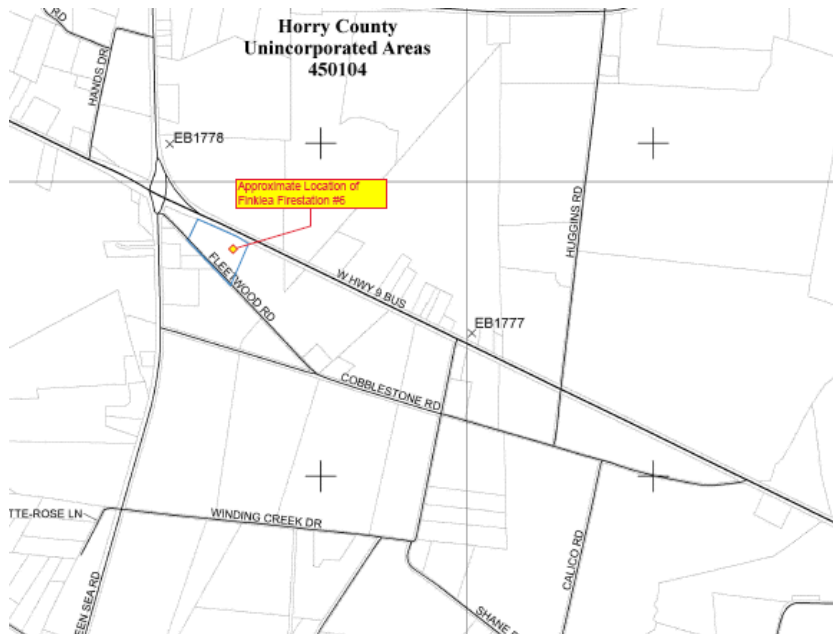
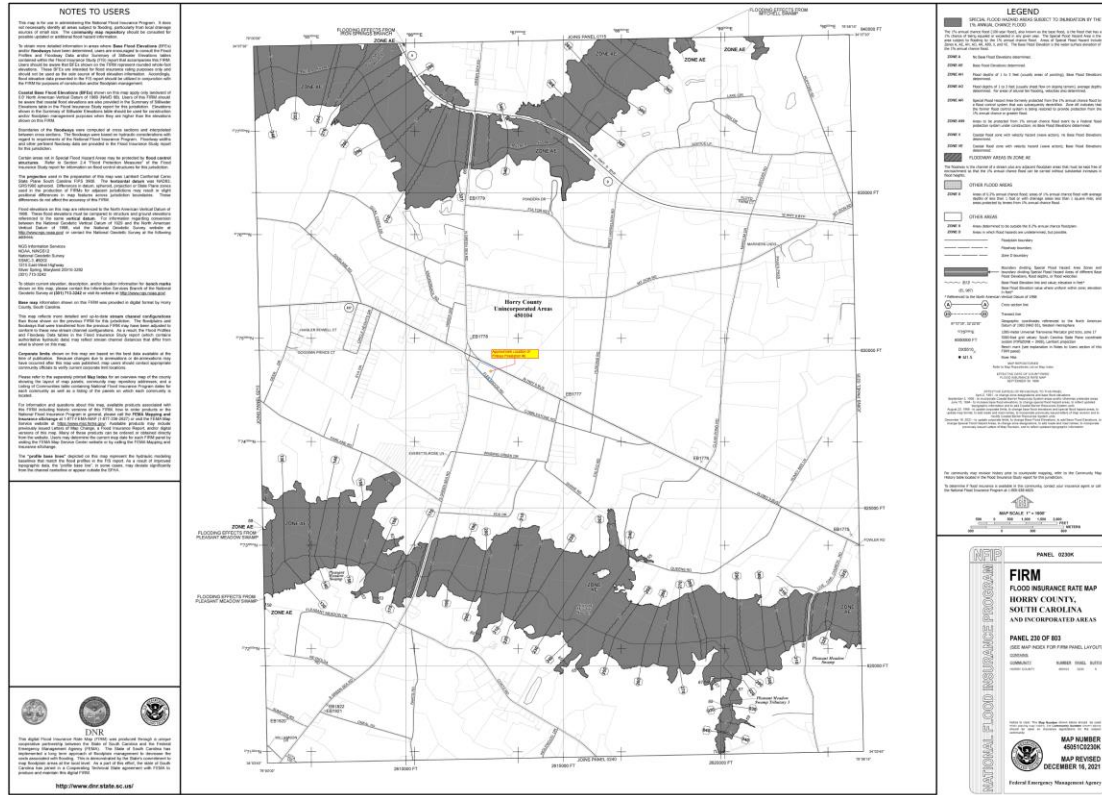
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Stormwater Pollution Prevention Plan
For the Construction General Permit (SCR100000)

FEMA FIRM Map



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Appendix B

Drainage Maps

1. Pre-Development Basin Map
2. Post Development Basin Map
3. Flow Path Quad Map

Pre-Development Drainage Map

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Post-Development Drainage Map

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Flow Path Quad Map

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Appendix C

Additional Approvals/Certifications

1. Coastal Zone Consistency Certification (Once Received)

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Appendix D

Please see the SWR (attached separately from the SWPPP for the following items)

1. Pre-Development Calculations
2. Post Development Calculations

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Appendix E

Inspection Log and Reports

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Appendix F

Rainfall Log and Reports

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Stormwater Pollution Prevention Plan
For the Construction General Permit (SCR100000)

SWPPP Rainfall Records (January - June)										Year:	
January	Rainfall	February	Rainfall	March	Rainfall	April	Rainfall	May	Rainfall	June	Rainfall
1		1		1		1		1		1	
2		2		2		2		2		2	
3		3		3		3		3		3	
4		4		4		4		4		4	
5		5		5		5		5		5	
6		6		6		6		6		6	
7		7		7		7		7		7	
8		8		8		8		8		8	
9		9		9		9		9		9	
10		10		10		10		10		10	
11		11		11		11		11		11	
12		12		12		12		12		12	
13		13		13		13		13		13	
14		14		14		14		14		14	
15		15		15		15		15		15	
16		16		16		16		16		16	
17		17		17		17		17		17	
18		18		18		18		18		18	
19		19		19		19		19		19	
20		20		20		20		20		20	
21		21		21		21		21		21	
22		22		22		22		22		22	
23		23		23		23		23		23	
24		24		24		24		24		24	
25		25		25		25		25		25	
26		26		26		26		26		26	
27		27		27		27		27		27	

Stormwater Pollution Prevention Plan
For the Construction General Permit (SCR100000)

28		28		28		28		28		28	
29		29		29		29		29		29	
30				30		30		30		30	
31				31				31			
SWPPP Rainfall Records (July - December)										Year: _____	
July	Rainfall	August	Rainfall	September	Rainfall	October	Rainfall	November	Rainfall	December	Rainfall
1		1		1		1		1		1	
2		2		2		2		2		2	
3		3		3		3		3		3	
4		4		4		4		4		4	
5		5		5		5		5		5	
6		6		6		6		6		6	
7		7		7		7		7		7	
8		8		8		8		8		8	
9		9		9		9		9		9	
10		10		10		10		10		10	
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19		19		19		19		19		19	
20		20		20		20		20		20	
21		21		21		21		21		21	
22		22		22		22		22		22	
23		23		23		23		23		23	

Stormwater Pollution Prevention Plan
For the Construction General Permit (SCR100000)

24		24		24		24		24		24	
25		25		25		25		25		25	
26		26		26		26		26		26	
27		27		27		27		27		27	
28		28		28		28		28		28	
29		29		29		29		29		29	
30		30		30		30		30		30	
31		31				31				31	

Appendix G

Additional Site Logs and Records

DIAMOND SHORES SURVEYING, LLC
315 MAIN STREET, SUITE 11
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SWPPP Pre-Construction Conference Attendance Log

[illegible]

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SWPPP Contractor & Sub-Contractor Log

Name of Construction Site		Location of Construction Site
Company/Individual Name	Work Responsibilities	
1.)		
Start Date:		
Completion Date:		
2.)		
Start Date:		
Completion Date:		
3.)		
Start Date:		
Completion Date:		
4.)		
Start Date:		
Completion Date:		
5.)		
Start Date:		
Completion Date:		
6.)		
Start Date:		
Completion Date:		
7.)		
Start Date:		
Completion Date:		
8.)		
Start Date:		
Completion Date:		
9.)		
Start Date:		
Completion Date:		

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10.)	
Start Date:	
Completion Date:	

SWPPP Modification Log			
Name of Construction Site		Location of Construction Site	
Type of Modification	Description of Modification	Location of Modification	
☐ Major ☐ Minor			
Start Date:			
Completion Date:			
Reason for Modifications:		Approved/Implemented By:	
Type of Modification	Description of Modification	Location of Modification	
☐ Major ☐ Minor			
Start Date:			
Completion Date:			
Reason for Modifications:		Approved/Implemented By:	
Type of Modification	Description of Modification	Location of Modification	
☐ Major ☐ Minor			
Start Date:			
Completion Date:			
Reason for Modifications:		Approved/Implemented By:	
Type of Modification	Description of Modification	Location of Modification	
☐ Major ☐ Minor			
Start Date:			
Completion Date:			
Reason for Modifications:		Approved/Implemented By:	
Type of Modification	Description of Modification	Location of Modification	
☐ Major ☐ Minor			
Start Date:			
Completion Date:			
Reason for Modifications:		Approved/Implemented By:	

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Reason for Modifications:		Approved/Implemented By:	
Type of Modification	Description of Modification		Location of Modification
☐ Major ☐ Minor			
Start Date:			
Completion Date:			
Reason for Modifications:		Approved/Implemented By:	
Type of Modification	Description of Modification		Location of Modification
☐ Major ☐ Minor			
Start Date:			
Completion Date:			
<i>SWPPP Soil Stabilization Log</i>			
Name of Construction Site		Location of Construction Site	
Type of Stabilization	Description of Stabilization		Location of Stabilization
☐ Final ☐ Temporary			
Initiate Date:			
Completion Date:			
Additional work proposed for this area:		Inspection Frequency for Stabilized Area:	
Type of Stabilization	Description of Stabilization		Location of Stabilization
☐ Final ☐ Temporary			
Initiate Date:			
Completion Date:			
Additional work proposed for this area:		Inspection Frequency for Stabilized Area:	
Type of Stabilization	Description of Stabilization		Location of Stabilization
☐ Final ☐ Temporary			
Initiate Date:			
Completion Date:			

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Stormwater Pollution Prevention Plan
For the Construction General Permit (SCR100000)

Additional work proposed for this area:		Inspection Frequency for Stabilized Area:		
Type of Stabilization	Description of Stabilization		Location of Stabilization	
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:		Inspection Frequency for Stabilized Area:		
Type of Stabilization	Description of Stabilization		Location of Stabilization	
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:		Inspection Frequency for Stabilized Area:		

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Appendix H

NPDES Construction General Permit SCR100000

1. SCDHEC Notice of Intent (when approved)

DIAMOND SHORES SURVEYING, LLC
315 MAIN STREET, SUITE 11
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SECTION 313700 - RIP RAP

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers materials, labor and equipment for placement of rip rap for slope protection and erosion control as indicated on the drawings and as specified herein.

1.2 LUMP SUM PRICE

- A. The items listed in the bid shall be considered as sufficient to complete the work in accordance with the drawings and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for all material, equipment, labor, testing, construction supervision and all other work required for satisfactory completion of rip rap placement.

1.3 UNIT PRICES

- A. None this Section

1.4 SUBMITTALS

- A. None this Section.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store materials in a manner to prevent contamination or segregation. Do not stockpile materials in a manner or location that will cause excessive wetting or transporting of materials off-site or into storm drainage collection systems.

1.6 REGULATORY REQUIREMENTS

- A. Comply with Federal, State, and local regulations.
- B. Comply with the requirements of the land disturbance permit and stamped approved drawings issued for this project by South Carolina Department of Health and Environmental Control (SCDHEC) and/or the MS4.

1.7 QUALITY ASSURANCE

- A. Materials: All material submittals shall be submitted by the Contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.
- B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.
- C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the contacts who are familiar with his competence may be required to be submitted to verify experience.
- D. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the

finished product to the standards shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 RIP RAP

- A. Rip rap shall comply with requirements as specified in Section 804 of the SCDOT Standard Specifications for Highway Construction and addendums.

PART 3 - EXECUTION

3.1 SITE PREPARATION

- A. The surface to receive the rip rap shall be prepared to a relatively smooth condition free of obstructions, depressions, debris, and soft or low density pockets of material.
- B. Rip rap shall be placed in the manner and at the locations shown on the drawings.
- C. The contours and elevations shown on the drawings are to the surface of the stone.

3.2 PLACEMENT

- A. The minimum thickness or depth of stone layer shall be 12 inches.
- B. Placement shall begin in the trench at the bottom of the slope with filter fabric wrapped in stone at least 5 feet up the slope. The entire mass of stone shall be placed to be in conformance with the lines, grades, and thicknesses shown on the drawings.
- C. Rip rap shall be placed to its full course thickness in one operation and in such a manner as to avoid displacing the underlying material.
 - 1. Placement of rip rap in layers, or by dumping into chutes, or by similar methods likely to cause segregation will not be permitted.
 - 2. Stones shall not be dropped from a height greater than 3 feet during placement of the stones on top of filter fabric.
- D. The larger stones shall be well distributed and the entire mass of stone shall conform to the gradation specified. All materials that are part of rip rap protection shall be placed and distributed so there will be no large accumulations of either the larger or smaller sizes of stone.

3.3 INSPECTIONS

- A. Notify the Owner, Project Representative and Engineer a minimum of 72 hours prior to all required observations, inspections or tests.
- B. All work conducted and materials furnished shall be subject to review by the Engineer or the Project Representative. The Engineer will also have the right to require that any portion of the work be conducted in his presence.
 - 1. If the work is covered after such instruction, it shall be exposed by the Contractor for observation.
 - 2. However, if the Engineer is notified that such work is scheduled and the Engineer fails to appear

within 72 hours, the Contractor may proceed without him.

- C. All improper work shall be reconstructed and all materials which do not conform to the requirements of the specifications shall be removed from the work upon written notice.

- 1. The Engineer shall have the right to mark materials as rejected to distinguish them as such.

3.4 ACCEPTANCE

- A. Final acceptance will be based on satisfactory placement of rip rap as approved by the Owner and/or Engineer. Rip rap shall be re-worked to the satisfaction of the Owner and/or Engineer until specified requirements are met.
- B. All additional work which is the result of a failed inspection shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 313700

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers all work associated with:
 - 1. Subbase Course Aggregate and Soil Aggregate
 - 2. Aggregate Base Course
 - 3. Intermediate Course
 - 4. Base Course
 - 5. Prime Coat
 - 6. Tack Coat
 - 7. Asphaltic Concrete

1.2 DEFINITIONS

- A. Compaction: The process of mechanically stabilizing a material by increasing its density. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D 1557 for general soil types or ASTM D 4253 or ASTM D 4254 for isolated cohesionless materials, abbreviated in this specification as "__ percent maximum density." "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure ASTM D 1188 or ASTM D 2726 "__ percent maximum density for asphaltic concrete."
- B. Course: A layer or lift of soil or asphaltic concrete placed on top of a previously prepared or placed surface.
- C. Lift: A layer or course of soil or asphaltic concrete placed on top of a previously prepared or placed surface.
- D. Subgrade: Existing, in-situ soil or other material that is remaining after stripping or excavation. The subgrade is always existing material on which fill or new structures are to be placed.

1.3 LUMP SUM PRICE

- A. The items listed in the proposal shall be considered sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for the material, compaction, shaping, finishing, dressing, disposal of surplus material, testing, construction supervision and all other work required for satisfactory completion of the asphalt paving.

1.4 UNIT PRICES

- A. None this Section.

1.5 OPTIONS

- A. As specified herein, options are provided for use of materials specified in the applicable sections of the "South Carolina Department of Transportation Standard Specification for Highway Construction". Execution, administration, contractual and payment provisions do not apply. Where the term "State" is used, it shall mean "Owner."

1.6 SUBMITTALS

- A. Asphaltic Concrete Mix Design: For each mix to be used on the project by course, submit a mix design in accordance with the following:
 - 1. Mix designs in compliance with requirements of the "South Carolina Department of Transportation Standard Specifications for Highway Construction". Mix design shall bear the approval of the SCDOT and shall be dated within **24 months** of the date of the submittal. All materials listed in the mix design shall be the materials used to produce the asphaltic concrete.
- B. Laboratory Testing: Submit laboratory testing data for approval as identified in the paragraph titled "Laboratory Testing" for any the following materials to be used on the project before any material is delivered to the site.
 - 1. Subbase Course, Base Courses and Asphaltic Concrete (each course)
 - a. Maximum density
- C. Certifications: Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for the following:
 - 1. Subbase Courses
 - 2. Base Course
 - 3. Tack coat
 - 4. Prime coat
 - 5. Asphaltic Concrete (each course)
 - a. Coarse aggregate
 - b. Fine aggregate
 - c. Mineral filler
 - d. Asphalt cement
- D. Field Testing: Submit field testing data as identified in the paragraph titled "Field Testing" for the following:
 - 1. Subbase and Base Courses
 - a. In place densities
 - b. Grade
 - c. Straight Edge
 - 2. Asphaltic Concrete (each course)
 - a. In place density
 - b. Mix Design Compliance
 - c. Grade
 - d. Straight Edge

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store materials in a manner to prevent contamination or segregation. Do not stockpile materials in a manner or location that will cause excessive wetting or transporting of materials off-site or into storm drainage collection systems.

1.8 REGULATORY REQUIREMENTS

- A. Comply with federal, state and local regulatory requirements.

1.9 QUALITY ASSURANCE

- A. Materials: All material submittals shall be submitted by the contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.
- B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.
- C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Owner and/or Engineer, a list of projects and the contacts who are familiar with his competence may be required to be submitted to verify experience.
- D. Design: Devices, equipment, structures, and systems not designed by the Engineer that the Contractor wishes to furnish shall be designed by either a registered professional engineer or by someone the Engineer accepts as qualified. Complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.
- E. Environmental Conditions: Place bituminous mixture only during dry weather and on dry surfaces. Place asphaltic concrete only when surface temperature of underlying course is greater than 45°F for course thicknesses greater than one inch and 55°F for course thickness' one inch or less.
- F. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 AGGREGATE SUBBASE

- A. Blend of coarse aggregates and binder materials to produce a uniform subbase having a minimum CBR of at least 30 at 95% of maximum laboratory density determined in accordance with ASTM D1883.
 - 1. Material retained on the No. 10 sieve shall be designated coarse aggregate and material passing the No. 10 sieve shall be designated binder material.
- B. Binder material: In-situ soil or fill classified as SW, SP, SM, SC, or CL in accordance with ASTM D2487.
- C. Coarse Aggregate: ASTM C33. Size #467 or #57.

2.2 SOIL AGGREGATE SUBBASE

- A. In accordance with "South Carolina Department of Transportation Standard Specifications for Highway Construction", Section 302 - Soil-Aggregate Subbase.

2.3 GRADED AGGREGATE BASE COURSE

- A. Blend of coarse aggregates and binder materials to form a uniform base having a minimum CBR of

at least 80 at 95% maximum laboratory density determined in accordance with ASTM D1883.

1. Material retained on the No. 10 sieve shall be designated coarse aggregate and material passing the No. 10 sieve shall be designated binder material.

B. Binder material: Local sand or crushed coarse aggregate, from sources approved by the Engineer.

1. The portion of material passing the No. 40 sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than 6 determined by ASTM D4318.

C. Coarse Aggregate: ASTM C33.

D. Mixture of coarse aggregate and binder material shall conform to the following gradation when tested in accordance with ASTM C136:

Sieve Size	Percent by Weight Passing
2 inch	100
1.5 inch	95-100
1 inch	70-100
0.5 inch	50-80
#4	35-55
#30	12-31
#200	6-15
Clay	0 to 25
Volume Change	0 to 15
Liquid Limit	0 to 25
Plasticity Index	0 to 6

E. In accordance with "South Carolina Department of Transportation Standard Specifications for Highway Construction", Section 305 – Graded Aggregate Base.

2.4 ASPHALTIC CONCRETE BASE COURSE

A. In accordance with "South Carolina Department of Transportation Standard Specifications for Highway Construction", Section 310 - Asphalt Base Course.

2.5 PRIME COAT

A. Asphalt Emulsion conforming to ASTM D977, Grade SS-1, MC-30 liquid asphalt conforming to ASTM D2027, or RC-30 liquid asphalt, conforming to ASTM D2028.

B. In accordance with "South Carolina Department of Transportation Standard Specifications for Highway Construction", Section 305.4.6 – Application of Prime Coat.

2.6 TACK COAT

A. Asphalt emulsion conforming to ASTM D977, Grade RS-1, MS-1, MS-2, HFMS-1, HFMS-2, SS- 1, CRS-1, CMS-2 or CSS-1. Except RS-1 and CRS-1 emulsion may be diluted with not more than 50 percent water.

B. In accordance with "South Carolina Department of Transportation Standard Specifications for Highway Construction", Section 401.4.18 – Application of Prime or Tack Coat.

2.7 ASPHALTIC CONCRETE

- A. Shall be hot mixed, hot laid asphaltic concrete of the compacted thickness indicated.
- B. Mix designs shall be prepared in accordance with the "South Carolina Department of Transportation Standard Specifications for Highway Construction" per the following sections.
 - 1. Section 401 – Hot Mixed Asphalt (HMA) Pavement
 - 2. Section 402 – HMA Intermediate Course, Type B or Type C
 - 3. Section 403 – HMA Surface Course, Type C

PART 3 - EXECUTION

3.1 SAWCUTTING OF EXISTING PAVEMENTS

- A. Provide full depth sawcuts through existing asphaltic concrete pavements where new asphaltic concrete pavements are to join. Sawcuts shall be straight and vertical and shall be located a minimum of 3 inches from the existing edge or as indicated on the drawings.

3.2 PREPARATION OF SUBGRADE OR FILL

- A. Prepare subgrade and/or fill as specified in Section "EARTH MOVING".

3.3 SUBBASE AND BASE COURSES

A. Soil Aggregate Subbase

- 1. In accordance with "South Carolina Department of Transportation Standard Specifications for Highway Construction", Section 302 - Soil-Aggregate Subbase.
- 2. In accordance with the Report of Geotechnical Exploration by S&ME dated May 9, 2024, rigid and flexible pavement sections shall both be placed over a minimum 18" of Sandy Subbase Fill Material as defined in the report. Refer to the report and pavement section details for placement of geotextile material.

B. Aggregate Subbase and Graded Aggregate Base Course

- 1. Placement: Place aggregate course on prepared subgrade or fill in maximum loose lifts of 8 inches.
 - a. Do not place on surfaces that are muddy, frozen or that contain frost.
 - b. Total thickness shall be as indicated.
- 2. Compaction: Compact the aggregate course through the full depth to not less than 100 percent of maximum laboratory density per ASTM D1557.
 - a. Compact with equipment well suited for material being compacted.
 - b. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment being used.
 - c. Compact each lift as specified herein prior to placing the overlaying lift.
- 3. Tolerances
 - a. Finished grade of aggregate course shall be within 0.05 feet of indicated finish grade.
 - b. Finished surface of aggregate course shall not vary more than 0.375 inches when tested

- with a 10 foot straightedge.
 - c. Finished thickness of aggregate course shall not vary more than 0.50 inches from the required thickness at any point and the average of all depth measurements shall be at least that indicated.
 - d. Areas not meeting the specified requirements will be rejected until corrected by the Contractor
4. Protection: Graded areas shall be protected from traffic, erosion, settlement, or any washing away that may occur from any cause prior to acceptance. Any repair or reestablishment of final grades shall be made prior to final acceptance.

C. Asphaltic Concrete Base Course

1. In accordance with "South Carolina Department of Transportation Standard Specifications for Highway Construction", Section 310 - Asphalt Base Course.

3.4 PRIME COAT

- A. Application: After receiving approval from the Engineer for priming, apply not more than 0.28 gal/sq. yd. nor less than 0.25 gal/sq. yd. to the completed and accepted base course.
1. Where base consists of fossiliferous limestone, the prime rate shall be not more than 0.15 gal/sq. yd. nor less than 0.10 gal/sq. yd.
 2. The prime coat shall only be applied when the base course is only slightly damp, and when temperature of the air in the shade is 55°F or above.
 3. In places where the distributor bars cannot reach, it will be necessary to apply the prime coat with a hand sprayer attached to the distributor by a hose.
- B. Protection: Do not permit traffic on the primed area until the prime coat has cured adequately.

3.5 TACK COAT

- A. Application: Apply not more than 0.15 gal/sq. yd. nor less than 0.05 gal/sq. yd. to indicated contact surfaces. Net rate of application shall be 0.10 gal/sq. yd. of net bitumen.
1. Apply half-rate application to prime coats that have been contaminated by traffic or dust.
 2. The tack coat shall only be applied when the contact surface is dry and when the temperature has not been below 35°F for 12 hours immediately prior to application. The tack coat shall only be applied when the temperature of the air in the shade is 55°F or above.
 3. Work shall be planned so that no more tack coat than is necessary for the day's operation is placed on the surface.
 4. In places where the distributor bars cannot reach, it will be necessary to apply the tack coat with a hand sprayer attached to the distributor by a hose. When hand spray methods are used, care should be taken to give the surface a very light application of the asphalt.
- B. Protection: Except paving equipment, do not permit any traffic on tacked surfaces.

3.6 ASPHALTIC CONCRETE

A. Mixing and Preparation of Bituminous Mixture

1. Plant mix bituminous mixture to comply with requirements specified herein.

B. Transportation of Bituminous Mixture

1. Transport bituminous mixture in trucks that have, tight, clean, smooth beds that have been coated with a minimum amount of a concentrated solution of hydrated lime and water to prevent adhesion of the mixture to the truck bodies. Each load shall be covered with canvas or other approved material of ample size to protect the mixture from the weather and to prevent loss of heat. Deliveries shall be made so that the spreading and rolling of all mixture prepared for one day's run can be completed during daylight, unless adequate, approved artificial lighting is provided. The mixture shall be delivered to the area to be paved in such a manner that the temperature at the time of dumping into the spreader will not be less than 250°F. Any loads that are below minimum temperature, that have crusts of cold, unworkable material, or that have been wet excessively by rain will be rejected. Hauling over freshly laid material will not be permitted.

C. Machine Spreading

1. Prior to the laying of the asphaltic concrete, clean underlying course of foreign or objectionable matter with power blowers or power brooms, supplemented by hand brooms and other cleaning methods where necessary.
2. The range of temperatures of the mixtures at the time of spreading shall be between 250°F and 300°F. Bituminous concrete having temperatures less than minimum spreading temperature when dumped into the spreader will be rejected. Adjust spreader and regulate speed so that the surface of the course is smooth and continuous without tears and pulling, and of such depth that, when compacted, the surface conforms with the cross section, grade, and contour indicated. Unless otherwise directed, begin the placing along the centerline of areas to be paved on a crowned section or on the high side of areas with a one-way slope. Place mixture in consecutive adjacent strips having a minimum width of 10 feet, except where the edge lanes require strips less than 10 feet to complete the area. Construct longitudinal joints and edges to true line markings. Establish lines parallel to the centerline of the area to be paved, and place string lines coinciding with the established lines for the spreading machine to follow. Provide the number and location of the lines needed to accomplish proper grade control. When specified grade and smoothness requirements can be met for initial lane construction by use of an approved long ski-type device of not less than 30 feet in length and for subsequent lane construction by use of a short ski or shoe, in-place string lines for grade control may be omitted. Place mixture as nearly continuous as possible and adjust the speed of placing as needed to permit proper rolling.

D. Shoveling, Raking, and Tamping After Machine Spreading

1. Shovelers and rakers shall follow the spreading machine. Add or remove hot mixture and rake the mixture as required to obtain a course that when completed will conform to requirements specified herein. Broadcasting or fanning of mixture over areas being compacted is prohibited. When segregation occurs in the mixture during placing, suspend spreading operation until the cause is determined and corrected. Correct irregularities in alignment left by the spreader by trimming directly behind the machine. Immediately after trimming, compact edges of the course by tamping laterally with a metal lute or by other approved methods. Distortion of the course during tamping is prohibited.

E. Hand Spreading in Lieu of Machine Spreading

1. In areas where the use of machine spreading is impractical, spread mixture by hand. The range of temperatures of the mixtures when dumped onto the area to be paved shall be between 250 and 300°F. Mixtures having temperatures less than minimum spreading temperature when dumped onto the area to be paved will be rejected. Spread hot mixture with rakes in a uniformly loose layer of a thickness that, when compacted, will conform to the required grade, thickness, and smoothness. During hand spreading, place each shovel full of mixture by turning the shovel over in a manner that will prevent segregation. Do not place

mixture by throwing or broadcasting from a shovel. Do not dump loads any faster than can be properly handled by the shovelers and rakers.

F. Compaction of Mixture

1. Compact mixture by rolling. Begin rolling as soon as placement of mixture will bear rollers. Delays in rolling freshly spread mixture shall not be permitted. Start rolling longitudinally at the extreme sides of the lanes and proceed toward center of pavement, or toward high side of pavement with a one-way slope. Operate rollers so that each trip overlaps the previous adjacent strip by at least one foot. Alternate trips of the roller shall be of slightly different lengths. Conduct tests for conformity with the specified crown, grade and smoothness immediately after initial rolling. Before continuing rolling, correct variations by removing or adding materials as necessary. If required, subject course to diagonal rolling with the steel wheeled roller crossing the lines of the previous rolling while mixture is hot and in a compactible condition. Speed of the rollers shall be slow enough to avoid displacement of hot mixture. Correct displacement of mixture immediately by use of rakes and fresh mixture, or remove and replace mixture as directed. Continue rolling until roller marks are eliminated and course has a density of at least 96 percent but not more than 100 percent of that attained in a laboratory specimen of the same mixture prepared in accordance with ASTM D 1559. During rolling, moisten wheels of the rollers enough to prevent adhesion of mixture to wheels, but excessive water is prohibited. Operation of rollers shall be by competent and experienced operators. Provide sufficient rollers for each spreading machine in operation on the job and to handle plant output. In places not accessible to the rollers, compact mixture thoroughly with hot hand tampers. Skin patching of an area after compaction is prohibited. Remove mixture that becomes mixed with foreign materials or is defective and replace with fresh mixture compacted to the density specified herein. Roller shall pass over unprotected edge of the course only when laying of course is to be discontinued for such length of time as to permit mixture to become cold.

G. Tolerances

1. Finished grade of asphaltic concrete shall be within 0.03 feet of indicated finish grade.
2. Finished surface shall not vary more than 1/8 inch when tested with a 10 foot straightedge.
3. The finished thickness shall not vary more than 1/4 inch from required thickness at any point and average thickness of depth measurements shall be at least the thickness indicated.
4. The finished surface shall be uniform in appearance and texture over the entire surface, including at joints. The entire surface shall be free of evidence of segregation, honeycombs and back scattering.
5. Areas not meeting the above requirements will be rejected until corrected by the Contractor.

H. Joints

1. Joints shall present the same texture and smoothness as other portions of the course, except permissible density at the joint may be up to 2 percent less than the specified course density. Carefully make joints between old and new pavement or within new pavements in a manner to ensure a thorough and continuous bond between old and new sections of the course. Vertical contact surfaces of previously constructed sections that are coated with dust, sand, or other objectionable material shall be painted with a thin uniform coat of emulsion or other approved bituminous material just before placing fresh mixture.
2. Transverse Joints
 - a. Roller shall pass over unprotected end of freshly laid mixture only when laying of course is to be discontinued. Except when an approved bulkhead is used, cut back the edge of previously laid course to expose an even, vertical surface for the full thickness of the course. When required, rake fresh mixture against joints, thoroughly tamp with hot tampers, smooth

with hot smoothers, and roll. Transverse joints in adjacent lanes shall be offset a minimum of 2 feet.

3. Longitudinal Joints

- a. Space 6 inches apart. Do not allow joints to coincide with joints of existing pavement or previously placed courses. Spreader screed shall overlap previously placed lanes 2 to 3 inches and be of such height to permit compaction to produce a smooth dense joint. With a lute, push back mixture placed on the surface of previous lanes to the joint edge. Do not scatter mix. Remove and waste excess material. When edges of longitudinal joints are irregular, honeycombed, or poorly compacted, cut back unsatisfactory sections of joint and expose an even vertical surface for the full thickness of the course. When required, rake fresh mixture against joint, thoroughly tamp with hot tampers, smooth with hot smoothers, and roll while hot.
- I. Protection: Do not permit traffic, including heavy equipment, on asphaltic concrete until surface temperature has cooled to at least 120°F.

3.7 PROTECTION

- A. Existing Pavement: Protect existing pavements to remain from damage. Movement of construction machinery and equipment over existing pavements during construction shall be at the Contractor's risk. Existing pavements damaged by the Contractor's operations shall be repaired or replaced to their original condition at the Contractor's expense.
- B. Erosion Control: Protect existing streams, ditches, and storm drain inlets from water-borne soil by the means indicated on the contract drawings.
- C. Existing Utilities: Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to start of construction. The Contractor shall contact the local utility location company or each applicable utility company as required for assistance in locating existing utilities.
- D. Structures and Surfaces: Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, or any other damage. Repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance.

3.8 INSPECTIONS

- A. Notify the Owner, Project Representative and Engineer a minimum of 72 hours prior to all required observations, inspections or tests.
- B. All work conducted and materials furnished shall be subject to review by the Engineer or the Project Representative. The Engineer will also have the right to require that any portion of the work be conducted in his presence.
 1. If the work is covered after such instruction, it shall be exposed by the Contractor for observation.
 2. However, if the Engineer is notified that such work is scheduled and the Engineer fails to appear within 72 hours, the Contractor may proceed without him.
- C. All improper work shall be reconstructed and all materials which do not conform to the requirements of the specifications shall be removed from the work upon written notice.

1. The Engineer shall have the right to mark materials as rejected to distinguish them as such.

3.9 TESTING

- A. All testing shall be made at the Owner's expense. The Engineer shall approve test locations.
- B. Notify the testing laboratory, Engineer and Owner a minimum of 72 hours prior to all tests.
- C. Test results shall be furnished to the Contractor, Engineer and Owner within 72 hours after field tests are taken.
- D. Laboratory Testing
 1. Independent testing laboratory shall operate in accordance with ASTM E329 and shall be approved by the Engineer prior to engagement.
 2. Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test. Agencies to be used shall be submitted to the Engineer for review prior to engagement.
 3. Aggregate Subbase and Graded Aggregate Base Courses
 - a. Maximum Density and Optimum Moisture Content: ASTM D1557 for general soil types and ASTM D4253 or ASTM D4254 for isolated cohesionless materials.
 - b. Frequency: One maximum density and optimum moisture content test for each source.
- E. Field Testing
 1. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results.
 2. If any test performed fails to meet these specifications, Independent Testing Laboratory shall immediately notify the Owner, Engineer, and Contractor.
 3. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that it may deem necessary. The Contractor shall provide free access to the site for testing activities.
 4. Aggregate Subbase and Graded Aggregate Base Courses
 - a. In-Place Density: 1 per 1000 sq. yd. per course and per lift, in accordance with one of the following:
 - 1) Sand Cone Method: ASTM D1556.
 - 2) Balloon Method: ASTM D2167.
 - 3) Nuclear Method: ASTM D2922.
 - b. Grade: Entire site (50 feet grid maximum).
 - c. Straightedge: Entire site (25 feet grid maximum).
 5. Asphaltic Concrete (each course)
 - a. Mix Design Compliance
 - 1) One analysis for each batch, but no less than one analysis for each 250 tons of asphaltic concrete produced or fraction thereof of asphalt produced.

- b. Maximum Density of Compacted Asphaltic Concrete:
 - 1) ASTM D1188 or ASTM D2726.
 - 2) One density test for each batch, but no less than one test for each 250 tons of asphaltic concrete produced or fraction thereof of asphalt produced.
- c. In-Place Density: 1 per 1000 sq. yd. per course and per lift, in accordance with one of the following:
 - 1) ASTM D2950.
 - 2) Determine by taking 4 inch diameter cores. Separate courses by sawing.
 - 3) Determine in-place density of cores in accordance ASTM D1188 or ASTM D2726.
- d. Grade: Entire site (50 feet grid maximum).
- e. Straightedge: Entire site (25 feet grid maximum).

3.10 ACCEPTANCE

- A. If a tested material does not meet or exceed the specified requirements, the Contractor shall perform additional testing as directed by the Engineer to adequately define the limits of the material not meeting the specifications. Materials shall be re-tested to the satisfaction of the Engineer until specified requirements are met.
- B. All additional testing and work that is the result of a failed inspection or test shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers all materials, labor and equipment for jointed, portland cement concrete pavement including base course and joint sealing and all associated materials and work.

1.2 DEFINITIONS

- A. Compaction: The process of mechanically stabilizing a material by increasing its density. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D1557 for general soil types or ASTM D 4253 or ASTM D 4254 for isolated cohesionless materials, abbreviated in this specification as " percent maximum density".
- B. Lift: A layer or course of soil placed on top of a previously prepared or placed surface.
- C. Subgrade: Existing, in-situ soil or other material that is remaining after stripping or excavation. The subgrade is always existing material on which fill or new structures are to be placed.

1.3 LUMP SUM PRICE

- A. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for the material, compaction, shaping, finishing, dressing, disposal of surplus material, testing construction supervision and all other work required for satisfactory completion of concrete pavement.

1.4 UNIT PRICES

- A. None this Section.

1.5 OPTIONS

- A. As specified herein, options are provided for use of materials specified in the applicable sections of the "South Carolina Department of Transportation Standard Specifications for Highway Construction (SCDOT SSHC)". Execution, administration, contractual and payment provisions do not apply. Where the term "State" is used, it shall mean "Owner".

1.6 SUBMITTALS

A. Mix Designs

- 1. Submit a design mix for each class of concrete proposed for use. The mix shall be prepared by an approved testing laboratory. Compressive strength of at least 4 test cylinders of the design mix shall indicate 15% higher than 28 days strength specified.

- B. Laboratory Testing: Submit laboratory testing data for approval as identified in the paragraph titled "Laboratory Testing" for any the following materials to be used prior to any material is delivered to the site.

- 1. Aggregate Base: Maximum density.

- C. Field Testing: Submit field testing data as identified in the paragraph titled “Field Testing” for the following:
 - 1. Aggregate Base: In place density.
 - 2. Portland Cement Concrete: Compressive Strength Tests (7 day and 28 day).
- D. Certifications: Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for the following:
 - 1. Aggregate Base
 - 2. Portland Cement Concrete
 - a. Aggregate
 - b. Admixtures
 - c. Cement
 - 3. Joints
 - a. Sealant
 - b. Filler
 - 4. Reinforcement
 - a. Submit reinforcing in accordance with Geotechnical Report recommendations and details.
 - 5. Geotextile Fabric
 - a. Mirafi 140-N
 - b. Mirafi HP-370

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store materials in a manner to prevent contamination or segregation. Do not stockpile materials in a manner or location that will cause excessive wetting or transporting of materials off-site or into storm drainage collection systems.

1.8 REGULATORY REQUIREMENTS

- A. Comply with all federal, state and local regulatory requirements.

1.9 QUALITY ASSURANCE

- A. Materials: All material submittals shall be submitted by the contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.
- B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.
- C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Owner and/or Engineer, a list of projects and the contacts who are familiar with his competence may be required to be submitted to verify experience.
- D. Design: Devices, equipment, structures, and systems not designed by the Engineer

that the Contractor wishes to furnish shall be designed by either a registered professional engineer or by someone the Engineer accepts as qualified. Complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.

- E. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE

- A. Blend of coarse aggregate and binder material to form a uniform base having a minimum CBR of at least 80 at 95% maximum laboratory density determined in accordance with ASTM D1883. Material retained on the No. 10 sieve shall be designated coarse aggregate and material passing the No. 10 sieve shall be designated binder material.
 - 1. Binder material shall consist of local sand or crushed coarse aggregate, from sources approved by the Engineer. The portion of material passing the No. 40 sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than 6 determined by ASTM D4318.
 - 2. Coarse Aggregate: ASTM C 33.
 - 3. Mixture of coarse aggregate and binder material shall conform to the following gradation when tested in accordance with ASTM C136:

Sieve Size	Percent by Weight Passing
2 inch	100
1.5 inch	95-100
1 inch	70-100
0.5 inch	50-80
#4	35-55
#30	12-31
#200	6-15
Clay	0 to 25
Volume Change	0 to 15
Liquid Limit	0 to 25
Plasticity Index	0 to 6

- B. In accordance with "South Carolina State Highway Department Standard Specification for Highway Construction", Section 305 - Aggregate Base Course.

2.2 FORMS

- A. Shall be wood, plywood, metal, or other qualified material and shall be of the grade or type suitable to obtain the finish specified. Forms shall be constructed to the shape, for line, and grade required, and shall be maintained sufficiently rigid to prevent deformation under load.
- B. Form work and details construction shall conform to Chapter 6 of ACI 318.

2.3 REINFORCEMENT

- A. Dowel Bars: ASTM A615, Grade 40 or 60, plain billeted steel bars. Remove all burrs and projections from the bars. Coat sliding portion of each bar with shop applied paint. For doweled expansion joints, fit the outer end of the sliding portion of each dowel bar with a tight-fitting metal sleeve which conforms to manufacturer's recommendations for dowel bars.
- B. Tie Bars: ASTM A615, Grade 40 or 60, billeted or axle steel deformed bars.
- C. Reinforcement
 - 1. Reinforcing Steel: ASTM A615, Grade 60.
 - 2. Mesh Reinforcement: ASTM A1064, flat sheets.

2.4 JOINT MATERIALS

- A. Blocking Media: Compressible, non-shrinkable, non-reactive with joint sealant and non-absorption type such as plastic rod, free of oils or bitumens. Blocking media shall have a water absorption of not more than 5% by weight when tested in accordance with ASTM C509. Blocking media shall be consistent with the joint sealant manufacturers installation instructions and be at least 25% larger in diameter than the width of the joint being sealed.
- B. Preformed Joint Filler: ASTM D1751 or ASTM D1752 Type II or III. Filler must be compatible with sealant.
- C. Liquid Joint Sealant: Self-leveling silicone joint sealant such as Dow Corning 890SL or approved equal.
- D. Preformed Compression Seals
 - 1. ASTM D2628. Size as recommended by the manufacturer for the joint being sealed.
 - 2. Primer/lubricant/adhesive as recommended by the manufacturer.

2.5 CURING MATERIALS

- A. Impervious Sheeting: ASTM C171 with minimum sheet thickness of 10 mils. Non-reactive with other materials such as curing compound.
- B. Liquid Membrane-Forming Compound: ASTM C309, white pigmented, Type 2, Class A or B.

2.6 PORTLAND CEMENT CONCRETE

- A. Mix Materials
 - 1. Cement: ASTM C150 Type I or II.
 - 2. Water: Shall be clean, fresh and potable.
 - 3. Aggregates: ASTM C33
 - 4. Admixtures: Where not shown or specified, the use of admixtures is subject to the written approval of the Engineer.

- a. Air Entraining: ASTM C260. Use in all portland cement concrete pavement.
- b. Retarding: ASTM C494, Type B or D.
- c. Accelerating: ASTM D98.
- d. Water Reducing: ASTM C494.
- e. Fly Ash and Pozzolans: ASTM C618: Types N, F, or C.
- f. Ground Iron Blast Furnace Slag: ASTM C989: Grade 120.

B. Mix Properties

1. Design Mix in accordance with ACI 211.1. Concrete shall conform to the following:
 - a. Minimum Compressive Strength (28 days): 4,000 psi.
 - b. Maximum Aggregate Size: 1.5 inches.
 - c. Minimum Cement Content: 517 lbs./CY.
 - d. Maximum Water Cement Ratio: 0.5, by weight.
 - e. Range in Slump: 1 – 3 inches.
 - f. Allowable Air Content: 5, +/- 1.5%, by volume.
2. The minimum cement content is required for durable concrete with local aggregates but may be insufficient to obtain the specified strength, in which case, increase the cement content as necessary, without additional compensation under this contract.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE OR FILL

- A. Water shall be removed from excavations before concrete is deposited. Hardened concrete debris and other foreign materials shall be removed from the interior of forms and from the inside of mixing and conveying equipment. The reinforcement shall be made secure in position and shall be subject to examination and approval.
- B. Prepare subgrade or fill as specified in specification Section "EARTH MOVING".

3.2 AGGREGATE BASE COURSE

- A. Placement: Place aggregate base on prepared subgrade or fill in maximum loose lifts of 8 inches. Do not place on surfaces that are muddy, frozen or that contain frost. Total thickness shall be as indicated. Compact with equipment well suited for material being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment being used. Compact each lift as specified herein prior to placing the overlaying lift.
- B. Compaction: Compact the base course through the full depth to not less than 100% of maximum laboratory density.
- C. Tolerances
 1. Finished grade of base course shall be within 0.05 feet of indicated finish grade.
 2. Finished surface of base course shall not vary more than 0.375 inch when tested with a 10 foot straightedge.
 3. Finished thickness of base course shall not vary more than 0.5 inches from the required thickness at any point and the average of all depth measurements shall be at least that indicated.
 4. Areas not meeting the specified requirements will be rejected until corrected by

the Contractor.

- D. Protection: Graded areas shall be protected from traffic, erosion, settlement, or any washing away that may occur from any cause prior to acceptance. Any repair or re-establishment of final grades shall be made prior to final acceptance.

3.3 FORMS

- A. Construct forms to be removable without damaging the concrete.
- B. Coating: Before placing the concrete, coat the contact surfaces of forms, (except existing pavement sections where bonding is required) with a non-staining mineral oil, non-staining form coating compound, or two coats of nitro-cellulose lacquer. When using existing pavement as a form, clean existing concrete and then coat with an asphalt emulsion bondbreaker before concrete is placed.
- C. Grade and Alignment: Check and correct grade elevations and alignment of the forms immediately before placing the concrete.

3.4 REINFORCEMENT

- A. Dowel Bars: Install bars accurately aligned, vertically and horizontally, at indicated locations and dimensions. Dowel alignment shall not exceed 0.125 inch per foot from perpendicular to joint face. Before installation, thoroughly grease the sliding portion of each dowel.
- B. Tie Bars: Install bars, accurately aligned, vertically and horizontally at indicated locations. For slipform construction, insert bent tie bars by hand or other approved means.
- C. Slab Reinforcement
 - 1. Placement: Place reinforcement on suitable chairs prior to concrete placement or depress the reinforcement into the plastic concrete to the required elevation after concrete has been spread.
 - 2. Laps and Splices: Minimum 12 inches.
 - 3. Joints: Place reinforcement at joints as indicated on drawings.

3.5 MEASURING, MIXING, CONVEYING, AND PLACEMENT CONCRETE

- A. Measuring: ASTM C94.
- B. Mixing: ASTM C94, except as modified herein. Begin mixing within 30 minutes after cement has been added to aggregates. When air temperature is greater than 85°F, reduce mixing time and place concrete within 60 minutes. Additional water may be added to bring slump within the required limits specified, provided that the specified water/cement ratio is not exceeded.
- C. Conveying: ASTM C94.
- D. Placing: ACI 301, except as modified herein. Do not exceed vertical drop of 3 feet from point of discharge.
- E. Vibration: Immediately after spreading concrete, consolidate concrete with internal

type vibrating equipment along the boundaries of all slabs regardless of slab thickness, and interior of all slabs 6 inches or more in thickness. Limit duration of vibration to that necessary to produce consolidation of concrete. Excessive vibration will not be allowed. Vibrators shall be operated at any one location for more than 15 seconds. With approval from the Engineer, alternative vibration equipment may be utilized on unreinforced pavements less than 6 inches in thickness.

- F. Cold Weather: Do not place concrete when ambient temperature is below 40°F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Obtain written approval from the Engineer if it becomes necessary to place concrete in cold weather conditions that exceed these limitations and in such cases follow the practices found in ACI 306.1.
- G. Hot Weather: Maintain required concrete temperature in accordance with Figure 2.1.5 in ACI 305R to prevent evaporation rate from exceeding 0.2 pounds of water per square foot of exposed concrete per hour.
- H. Finishing Concrete: Start finishing operations immediately after placement of concrete. Use finishing machine, except hand finishing may be used in emergencies and for slabs in inaccessible locations or of such shape or size that machine finishing is impractical. Transverse and longitudinal surface tolerances shall be 0.25 inches in 10 feet.
 - 1. Side form finishing: Strike off and screed concrete to the required cross section by a power- driven transverse finishing machine. Elevation of concrete shall be such that, when consolidated and finished, pavement surface will be adequately consolidated and at the required grade. Equip finishing machine with two screeds which are readily and accurately adjustable for changes in pavement cross section and compensation for wear and other causes. Make as many passes as necessary to achieve the required compaction, retention of coarse aggregate at the surface, and surface of uniform texture, true to grade and cross section. Do not permit excessive operation over an area, which will result in an excess of mortar and water being brought to the surface.
 - 2. Equipment Operation: Maintain the travel of machine on the forms without lifting, wobbling or other variation of the machine which tend to affect the precision of the concrete finish. Keep tops of forms clean. During the first pass of the finishing machine, maintain a uniform ridge of concrete ahead of the front screed for its entire length.
 - 3. Joint Finish: Before concrete is hardened, correct edge slump of pavement, exclusive of edge rounding, in excess of .02 foot. Finish pavement surfaces on both sides of a joint to the same grade. Finish formed joints from a securely supported transverse bridge. Correct deviations before newly placed concrete has hardened.
 - 4. Hand Finishing: Strike off and screed surface of concrete to elevations slightly above finish grade so that when consolidated and finished, the pavement surface will be at the required grade. Vibrate the entire surface until the required compaction and reduction of surface voids is secured with a strike off template.
 - 5. Longitudinal Floating: After initial finishing, further smooth and consolidate concrete by means of hand operated longitudinal floats. Use floats that are not less than 12 feet long and 6 inches wide and stiffened to prevent flexing and warping.
 - 6. Surface Finish

- a. Plastic Grooving: After surface irregularities have been removed, give the concrete surface a uniformly roughened finish by use of a wire comb or other approved texturing device similar to a wire comb. Prior to plastic grooving, make one pass with burlap drag in the longitudinal direction. Complete grooving while concrete surface is in such condition that it will not be torn or unduly roughened, and before surface has obtained its initial set. Texture small irregular areas, or areas not suitable for machine texturing, with a hand operated device producing a textured surface equivalent to that required for machine combing.
- b. Burlap Drag Finish: Before concrete becomes non plastic, finish the surface of the slab by dragging on the surface a strip of clean, wet burlap measuring from 3 to 10 feet in length and 2 feet wider than the width of the pavement. Drag the surface to produce a finished surface with a fine granular or sandy texture without leaving disfiguring marks.
- c. Brooming: Finish the surface of the slab by brooming the surface with a new wire broom at least 18 inches wide. Gently pull the broom over the surface of the pavement form edge to edge just before the concrete becomes non plastic. Slightly overlap adjacent strokes of the broom. Broom perpendicular to centerline of the pavement so that the corrugations produced will be uniform in character and width and not more than 0.0625 inch in depth. Broomed surface shall be free from porous spots, irregularities, depressions, and small pockets or rough spots such as may be caused by accidentally disturbing particles of coarse aggregate embedded near the surface.
- d. Edging: At the time the concrete has attained a degree of hardness suitable for edging, carefully finish slab edges, including edges of formed joints, with an edge having a maximum radius of 0.125 inches. When brooming is specified as the final finish, edge transverse joints before starting brooming, then operate broom to obliterate as much as possible the marks left by the edging tool without disturbing the rounded corner left by the edger. Clean by removing loose fragments and soupy mortar for proper finishing. Refill voids solidly with a mixture of suitable proportions and consistency and refinish. Remove unnecessary tool marks and edges. Remaining edges shall be smooth and true to line.

3.6 JOINT SEALING

A. Equipment

1. Sandblasting: Sandblasting equipment shall include compressor, hose, and nozzles of proper size and shape to produce clean joints. Equip compressor with traps that will maintain compressed air free of oil and water.
2. Power Saws: Concrete saws shall be self-propelled and capable of sawing joints in concrete to indicated depths, width and alignment without spalling or raveling of concrete and at a production rate to avoid uncontrolled cracking.
3. Joint Sealing Equipment: In accordance with the sealant manufacturer's written instructions.

B. Joints

1. General: Joints shall be of the type and location shown on the drawings. Where curved pavement edges occur, make joints to intersect tangents to curve at right angles. Joints shall be in a continuous straight line extending from edge of pavement to edge of pavement. Do not stagger joints in abutting pavements except where shown. Protect joints from curing compounds by covering with tape or rope. Take necessary precautions to ensure proper curing at joints.

2. **Sawing of Joints:** Sawing will be conducted when concrete has hardened sufficiently to prevent raveling or flaking along edges of sawcut and before uncontrolled shrinkage cracking of pavement occurs. Time for joint sawing shall not exceed 12 hours from time of placement. Mark alignment of joints by chalk line or other suitable guide. Saw cuts shall not vary from required alignment by more than 0.5 inches in 10 feet. Sawcutting shall be carried on both during the night and day as required to prevent uncontrolled cracking. A supply of sawblades and at least one standby unit in working condition will be readily available during sawing operations. If uncontrolled cracking has occurred do not saw along the cracks, but notify the Engineer.
3. **Protection of Joints:** Immediately after each joint is sawed, thoroughly clean the saw cut and adjacent surface by flushing with water and blowing with compressed air to remove waste. Respray curing compound on surfaces affected by sawing and cleaning operations, but do not permit curing compound into the joints. Protect joints from intrusion of foreign materials by installation of blocking media as indicated or by other approved means. Do not seal joints until concrete has cured sufficiently as required by the sealant manufacturer's written instructions.
4. **Joints at Vertical Surfaces:** Construct joints where slabs abut light pads, catch basins, manholes, footings, walls, columns and structures as expansion joints, 0.75 inches wide and full depth of the pavement. Provide joints with preformed joint filler and sealant. Secure filler in place by bonding adhesive. Do not nail or stake filler in place. Fit abutting sections or ends of filler material tightly together to prevent concrete from entering expansion joint space. Place sealant in accordance with the manufacturer's written instructions.
5. **Expansion Joints:** Expansion joints shall have the dimensions and spacing shown, and be filled with preformed joint filler and sealant. Hold filler in place accurately and securely during placement and finishing of concrete. Use bonding adhesive to secure filler. Do not nail or stake filler in place. Under no circumstances shall concrete be left above expansion material or across the joint. Fit abutting sections or ends of filler material tightly together to prevent concrete from entering expansion joint space. Bulkheads, when used, shall have sufficient strength to remain straight form edge to edge of slab when concrete is placed against it.
6. **Contraction Joints:** Saw joints to dimensions indicated. Joint lines shall be within specified tolerances, straight, and extend for width of transverse joint and for entire length of longitudinal joint.
7. **Construction Joints**
 - a. **Butt Type Joints:** Provide butt type joints as indicated by placing fresh concrete against hardened concrete. Clean vertical surface of hardened concrete and coat with curing compound or asphalt emulsion bond breaker before concrete is placed. After concrete has cured, saw joint as specified and in accordance with dimensions shown.
 - b. **Emergency Stops:** If an emergency stop occurs remove the concrete back to the nearest transverse joint and install a keyed or doweled construction joint.
 - c. **Keyed Joints:** Locate keyways as indicated. When concrete is placed using side or stationary forms, use plastic or metal forms securely fastened to the side forms to form the keyway. When concrete is placed using slip form pavers, form the keyway by metal forms permanently attached to the side forms or during slip form operation by inserting preformed metal or plastic keyway liner which be left in place.
8. **Preparation of Joints**
 - a. **General:** Seal joints unless otherwise indicated. Immediately before

installation of sealant, thoroughly clean joints until, laitance, curing compound, preformed joint filler, and protrusions of hardened concrete are removed from sides and upper edges of joint space.

- b. **Cleaning of Sawed Joints:** Use a power-driven concrete saw to saw through preformed joint filler and to widen joint to indicated dimensions. Blow loosened materials from the joint with compressed air. Clean concrete joint faces and pavement joint surfaces extending at least one inch from the edges of joints by thoroughly sandblasting and air blowing until the surfaces are free of dust, dirt, curing compound, preformed joint filler, and other material that might prevent bonding of sealer to concrete.

9. Installation

- a. **Blocking Media:** Immediately after joints receive final cleaning, install blocking media specified in the bottom of the joint reservoir.
- b. **Liquid Sealants:** Install liquid sealants in accordance with the manufacturer's written instructions. Fill joints to the depths and tolerances indicated without formation of voids or entrapped air. Remove excess or spilled sealant from pavement and discard.
- c. **Preformed Compression Seals:** Install preformed compression seals in accordance with the manufacturer's written instructions. Size preformed compression seals appropriately for the joint being sealed as recommended by the manufacturer.

3.7 CURING

- A. **General:** Protect concrete adequately from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, oil stains and other deleterious actions. Do not allow newly placed pavement to dry out from the time it is placed until the expiration of the specified curing period. Use impervious sheeting curing or liquid membrane forming compound curing. Do not use membrane forming compound curing where surface is to be painted, where coverings are to be bonded, where other concrete is to be bonded. Maintain temperature of air next to concrete above 40°F for duration of curing.

- B. **Impervious Sheeting Curing:** Wet entire exposed surface thoroughly with a fine spray of water and then cover with impervious sheeting. Lay sheets directly on concrete surface and overlap 12 inches. Make sheeting not less than 18 inches wider than the surface being cured. Weigh down edges and overlaps to form closed joints. Repair or replace sheets when torn or otherwise damaged during curing. Leave sheeting on concrete surface to be cured for at least 7 days.

C. Liquid Membrane Forming Compound Curing

1. Seal or cover joint openings prior to application of curing compound to prevent curing compound from entering the joints. Compound shall remain on concrete for 7 days before removing sealer or covering, and placing sealing material in joints.
2. Apply compound immediately after surface loses its water sheen and has a dull appearance and before joints are sawed. Apply in strict accordance with manufacturer's written instruction. Apply an additional coat of compound immediately to areas where film is defective. Reapply to areas that are subject to heavy rainfall within 3 hours after curing compound has been applied in the same area.
3. Keep concrete surfaces to which liquid membrane forming compound have been applied free from vehicular traffic and other sources of abrasion for not less than

72 hours. Except for joint sawing operations, foot traffic is restricted until after 24 hours for inspection purposes. Maintain continuity of coating for the entire curing period and repair damage to coating immediately.

3.8 PROTECTION

- A. Protect new portland cement concrete pavement from damage for the duration of the contract.
- B. Existing Pavement: Protect existing pavements to remain from damage. Movement of construction machinery and equipment over existing pavements during construction shall be at the Contractor's risk. Existing pavements damaged by the contractor's operations shall be repaired or replaced to their original condition at the contractor's expense.
- C. Erosion Control: Protect existing streams, ditches, and storm drain inlets from water-borne soil by the means indicated on the contract drawings.
- D. Existing Utilities: Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall contact the local utility location company or each applicable utility company as required for assistance in locating existing utilities.
- E. Structures and surfaces: Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, or any other damage. Repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance.

3.9 INSPECTION AND TESTING

A. Inspections

- 1. Notify the Owner, Project Representative and Engineer a minimum of 72 hours prior to all required observations, inspections or tests.
- 2. All work conducted and materials furnished shall be subject to review by the Engineer or the Project Representative. The Engineer will also have the right to require that any portion of the work be conducted in his presence.
 - a. If the work is covered after such instruction, it shall be exposed by the Contractor for observation.
 - b. However, if the Engineer is notified that such work is scheduled and the Engineer fails to appear within 72 hours, the Contractor may proceed without him.
- 3. All improper work shall be reconstructed and all materials which do not conform to the requirements of the specifications shall be removed from the work upon written notice.
 - a. The Engineer shall have the right to mark materials as rejected to distinguish them as such.

B. Testing

- 1. All testing shall be made at the Owner's expense. The Engineer shall approve test locations.
- 2. Notify the testing laboratory, Engineer and Owner a minimum of 72 hours

- prior to all tests.
3. Test results shall be furnished to the Contractor, Engineer and Owner within 72 hours after field tests are taken.
 4. Laboratory Testing
 - a. Independent Testing Laboratory shall operate in accordance with ASTM E-329 (latest revision) and shall be approved by the Engineer prior to engagement.
 - b. Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test. Agencies to be used shall be submitted to the Engineer for review prior to engagement.
 - c. Aggregate Base:
 - 1) Maximum density and optimum moisture: ASTM D1557 for general soil types or ASTM D4253 or ASTM D4254 for isolated cohesionless materials.
 - 2) Frequency of laboratory testing: One maximum density and optimum moisture content test for each source.
 5. Field Testing
 - a. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results.
 - b. If any test performed fails to meet these specifications, Independent Testing Laboratory shall immediately notify the Owner, Engineer and Contractor.
 - c. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that it may deem necessary. The Contractor shall provide free access to the site for testing activities.
 - d. Field tests for in-place aggregate base materials shall be performed as follows:
 - 1) In-place density in accordance with one of the following:
 - a) Sand Cone Method: ASTM D1556
 - b) Balloon Method: ASTM D2167
 - c) Nuclear Method: ASTM D2922
 - 2) Grade
 - 3) Straightedge
 - e. Field test for portland cement concrete pavement shall be performed as follows:
 - 1) Slump Tests: ASTM C143.
 - 2) Compressive Tests: ASTM C39.
 - 3) Air Content Tests - ASTM C231.
 - 4) Surface Tests: After curing, test the entire pavement surface with a 10 foot straight edge. Remove and replace concrete, mechanically grind or profile concrete surface, or correct surface as approved, for any portion of the pavement which shows irregularities greater than 0.25 inches in 10 feet in a longitudinal and transverse direction.
 - 5) Thickness Tests: Measure during placement to determine in place thickness of concrete pavement.
 - 6) Reinforcement: Inspect reinforcement prior to installation to assure it is

free of loose flaky rust, loose scale, oil, mud, or other objectionable material.

- 7) Dowels: Inspect dowel placement prior to placing concrete to assure that dowels are of the size indicated, and are spaced, aligned, painted, and oiled as specified. Dowels shall not deviate from vertical or horizontal alignment after concrete placement by more than 0.125 inch per foot.

f. Frequency of field testing

1) Aggregate Base Course:

- a) In place density: 1 per 1000 SY per lift.
- b) Grade: Entire site (50 feet grid maximum).
- c) Straightedge: Entire site (25 feet grid maximum).

2) Portland Cement Concrete Pavement:

- a) Slump Tests: Take samples for slump determination from concrete during placement. Perform tests at the beginning of a concrete placement operation and at subsequent intervals to ensure that specification requirements are met. In addition, perform tests each time test cylinders are made.
- b) Compressive Tests: Make four test cylinders for each set of tests. Test two cylinders at 7 days and two at 28 days. Concrete strength will be considered satisfactory when the minimum of the 28 day test results equals or exceeds the specified 28 day compressive strength and no individual strength test is less than 3,200 psi. If the ratio of the 7 day strength test to the specified 28 day strength is less than 65%, make necessary adjustments for conformance. Frequency of compressive tests on concrete cylinders shall not be less than four test cylinders for each 50 CY or fraction thereof, placed. Concrete which is determined to be defective based on strength acceptance criteria herein, shall be removed and replaced with acceptable concrete at the contractor's expense.
- c) Air Content Tests: One sample taken during placement of concrete and at the same frequency as slump testing.
- d) Surface Tests: Entire site (25 feet grid maximum).

3.10 ACCEPTANCE

- A. If a tested material does not meet or exceed the specified requirements, the Contractor shall perform additional testing as directed by the Engineer to adequately define the limits of the material not meeting the specifications. Materials shall be re-tested to the satisfaction of the Engineer until specified requirements are met.
- B. All additional testing and work that is the result of a failed test shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 321313

SECTION 321613 - SITE WORK CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers all materials, labor and equipment for portland cement concrete used in structures, sidewalks, curb and gutter.

1.2 LUMP SUM PRICE

- A. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for the material, compaction, shaping, finishing, dressing, disposal of surplus material, testing construction supervision and all other work required for satisfactory completion of site work concrete.

1.3 UNIT PRICES

- A. None this Section.

1.4 SUBMITTALS

- A. Mix Designs: The Contractor shall submit for review a design mix for each class of concrete proposed for use. The mix shall be prepared by an approved testing laboratory. Compressive strength of at least four test specimens of the design mix shall indicate 15% higher than 28 days strength specified.
- B. Field Testing: Compressive strength tests.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store materials in a manner to prevent contamination or segregation. Do not stockpile materials in a manner or location that will cause excessive wetting or transporting of materials off-site or into storm drainage collection systems.

1.6 REGULATORY REQUIREMENTS

- A. Comply with all federal, state and local regulatory requirements.

1.7 QUALITY ASSURANCE

- A. Materials: All material submittals shall be submitted by the contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.
- B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.
- C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Owner and/or Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.

- D. Design: Devices, equipment, structures, and systems not designed by the Engineer that the Contractor wishes to furnish shall be designed by either a registered professional engineer or by someone the Engineer accepts as qualified. Complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.
- E. Environmental Conditions: Concrete shall be mixed and placed only when temperature is at least 40°F and rising.
- F. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 CONCRETE

- A. Design Mix in accordance with ACI 211.1.

Class	Compressive Strength (28 day)	Application
AA	4,000 psi	Pavements and driveways
A	3,000 psi	Curb and gutters, sidewalks, structures
B	2,500 psi	Thrust blocks

1. Maximum Water/Cement Ratio: 0.5.
2. Range in Slump: 2 – 5.
3. Cement: ATM C150, Type I.
4. Water: Shall be clean, fresh and potable.
5. Aggregates: ASTM C33.
6. Admixtures: Where not shown or specified, the use of admixtures is subject to the written approval of the Engineer.
 - a. Air Entraining: ASTM C260. Use in all portland cement concrete pavement.
 - b. Retarding: ASTM C494.
 - c. Accelerating: ASTM D98.
 - d. Water Reducing: ASTM C494.
 - e. Fly Ash and Pozzolans: ASTM C618, Types N, F, or C.
 - f. Ground Iron Blast Furnace Slag: ASTM C989, Grade 120.

2.2 FORMS

- A. Shall be wood, plywood, metal, or other qualified material and shall be of the grade or type suitable to obtain the finish specified. Forms shall be constructed to the shape, for line, and grade required, and shall be maintained sufficiently rigid to prevent deformation under load. Form work and details construction shall conform to Chapter 6 of ACI 318.

2.3 REINFORCEMENT:

- A. Reinforcing Steel: Conform to ASTM A615, Grade 60.
- B. Mesh Reinforcement: Conform to ASTM A185, flat sheets.

2.4 JOINT MATERIALS

- A. Blocking Media: Compressible, non-shrinkable, non-reactive with joint sealant and non-absorption type such as plastic rod, free of oils or bitumens. Blocking media shall have a water absorption of not more than 5% by weight when tested in accordance with ASTM C509. Blocking media shall be consistent with the joint sealant manufacturers installation instructions and be at least 25% larger in diameter than the width of the joint being sealed.
- B. Preformed Joint Filler: ASTM D1751 or ASTM D1752 Type II or III. Filler must be compatible with sealant.
- C. Liquid Joint Sealant: Silicone joint sealant such as Dow Corning 890SL or approved equal.

2.5 CURING MATERIALS

- A. Impervious Sheeting: ASTM C171 with minimum sheet thickness of 10 mils. Non-reactive with other materials such as curing compound.
- B. Liquid Membrane-Forming Compound: ASTM C309, white pigmented, Type 2, Class B, free of paraffin or petroleum.

2.6 ANCHORAGE ITEMS

- A. Slots, inserts, clips, and other devices for anchoring masonry, wood, steel, and mechanical items to concrete shall be of standard manufacture, and of qualified types as required to engage and anchor the work specified under other sections.

PART 3 - EXECUTION

3.1 PREPARATION BEFORE PLACING

- A. Water shall be removed from excavations before concrete is deposited. Hardened concrete debris, and other foreign materials shall be removed from the interior of forms and from the inside of mixing and conveying equipment. The reinforcement shall be made secure in position and shall be subject to examination and approval.
- B. Prepare surface to receive concrete in accordance with Section "EARTH MOVING".

3.2 FORMS

- A. Construct forms to be removable without damaging the concrete.
- B. Coating: Before placing the concrete, coat the contact surfaces of forms, (except existing pavement sections where bonding is required) with a non-staining mineral oil, non-staining form coating compound, or two coats of nitro-cellulose lacquer. When using existing pavement as a form, clean existing concrete and then coat with an asphalt emulsion bondbreaker before concrete is placed.
- C. Grade and Alignment: Check and correct grade elevations and alignment of the forms immediately before placing the concrete.

3.3 REINFORCEMENT

- A. Metal reinforcement shall be free from rust, scale or other coatings, and shall be accurately placed

and properly secured in position by concrete blocks or metal chairs and by spacers. Bars shall be bent cold. Exposed bars intended for bonding with fixture extensions shall be protected from corrosion by an accepted covering. Bar chairs shall be hot dipped galvanized where in contact with forms for concrete that is exposed to view.

B. Concrete Protection over Steel Reinforcement:

1. Concrete deposited against ground: 3 inches.
2. Formed surfaces exposed to weather or ground – Bars #6 and Larger: 2 inches.
3. Formed surfaces exposed to weather or ground – Bars less than #6: 1.5 inches.
4. Interior surfaces, beams, girders, and columns: 1.5 inches.
5. Slabs, walls, and joists – Bars #11 and smaller: 0.75 inches.

3.4 MEASURING, MIXING, AND CONVEYING CONCRETE

A. Measuring, mixing and conveying: ASTM C94.

- B. Concrete mixed at the job site shall be mixed in a batch mixer in accordance with ACI 318, and in a similar manner subject to approval. Mixing time for stationary mixers over 1 CY in capacity shall be increased 15 seconds for each additional 0.5 CY or fraction thereof of material mixed.

3.5 PLACING CONCRETE

A. Placing of concrete shall conform to Chapter 5 of ACI 318.

- B. Concrete having attained initial set or having contained water for one more than 90 minutes shall not be used in the work. Concrete shall not be dropped freely more than 5 feet on unexposed work, or more than 3 feet in exposed work. Concrete shall be mixed and placed only when temperature is at least 40°F and rising. Concrete footings shall be placed only upon surfaces that are free from frost, ice, mud, or other detrimental circumstances. When placed on dry soil or pervious material, waterproof paper or polyethylene sheeting shall be laid over the surfaces that are to receive the concrete.

3.6 FINISHES

- A. Concrete shall be deposited to the required thickness, compacted, screed to grade, and finished monolithically to a smooth broom finish. Where drains, or sumps occur, the concrete shall be sloped to drain. Slight honeycomb and minor defects shall be patched with cement mortar made with one part cement and two parts fine aggregate and then rubbed smooth with carborundum brick. Patching shall be accomplished immediately after forms are removed. Immediately after removing forms, other exposed surfaces shall be dampened, brush-coated with grout, and rubbed with a wood float. Floating devices shall be rubbed with burlap and kept damp by fog spraying.

3.7 CURING

- A. Immediately after placing or finishing, concrete surfaces not covered by forms shall be protected against moisture loss for not less than 7 days by use of impervious sheeting or curing compound. Curing compound shall be applied in strict accordance with the manufacturer's recommendations.

3.8 BONDING AND GROUTING

- A. Before depositing new concrete on concrete that has set, the surface of the set concrete shall be thoroughly cleaned of laitance, foreign matter, and loose particles leaving a rough surface with clean and sound exposed aggregate. Forms shall be re-tightened, and the surfaces of the set concrete shall be slushed with a grout coat of neat cement and water. Where an epoxy bonding

agent is called for on the drawings, the epoxy bonding agent shall be polysulfide liquid polymer and an epoxy resin combined at the job site, in equal volumes and thoroughly mixed. The mixed agent shall be applied on a clean concrete surface by brushing or spraying. A 10 mil coating shall be spread evenly to cover all bonding surfaces. When a bonding agent has been applied, and while the surface is still sticky, new concrete to be bonded shall be put in place.

3.9 PROTECTION

- A. Protect new concrete from damage for the duration of this contract.
- B. Existing Pavement: Protect existing pavements to remain from damage. Movement of construction machinery and equipment over existing pavements during construction shall be at the Contractor's risk. Existing pavements damaged by the contractor's operations shall be repaired or replaced to their original condition at the contractor's expense.
- C. Erosion Control: Protect existing streams, ditches, and storm drain inlets from water-borne soil by the means indicated on the contract drawings.
- D. Existing Utilities: Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall contact the local utility location company or each applicable utility company as required for assistance in locating existing utilities.
- E. Structures and surfaces: Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, or any other damage. Repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance.

3.10 INSPECTIONS AND TESTING

A. Inspections

- 1. Notify the Owner, Project Representative and Engineer a minimum of 72 hours prior to all required observations, inspections or tests.
- 2. All work conducted and materials furnished shall be subject to review by the Engineer or the Project Representative. The Engineer will also have the right to require that any portion of the work be conducted in his presence.
 - a. If the work is covered after such instruction, it shall be exposed by the Contractor for observation.
 - b. However, if the Engineer is notified that such work is scheduled and the Engineer fails to appear within 72 hours, the Contractor may proceed without him.
- 3. All improper work shall be reconstructed and all materials which do not conform to the requirements of the specifications shall be removed from the work upon written notice.
 - a. The Engineer shall have the right to mark materials as rejected to distinguish them as such.

B. Testing

- 1. All testing shall be made at the Contractor's expense. The Engineer shall approve test locations.
- 2. Notify the testing laboratory, Engineer and Owner a minimum of 72 hours prior to all tests.
- 3. Test results shall be furnished to the Contractor, Engineer and Owner within 72 hours after field tests are taken.
- 4. Laboratory Testing

- a. Independent Testing Laboratory shall operate in accordance with ASTM E-329 (latest revision) and shall be approved by the Engineer prior to engagement.
- b. Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test.

5. Field Testing

- a. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results.
- b. If any test performed fails to meet these specifications, Independent Testing Laboratory shall immediately notify the Owner, Engineer and Contractor.
- c. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that it may deem necessary. The Contractor shall provide free access to the site for testing activities.
- d. Field Tests
 - 1) Compressive strength test: ASTM C39
 - 2) Grade
- e. Frequency of field testing
 - 1) Compressive Strength: 3 test cylinders per each 50 CY of concrete placed or for each structure requiring more than 10 CY of concrete. One cylinder shall be tested at 7 days and two at 28 days in accordance with ASTM C39.
 - 2) Grade: Check each structure, sidewalk or other feature for proper grade, slope and cross slope.

3.11 ACCEPTANCE

- A. If a tested material does not meet or exceed the specified requirements, the Contractor shall perform additional testing as directed by the Engineer to adequately define the limits of the material not meeting the specifications. Materials shall be re-tested to the satisfaction of the Engineer until specified requirements are met.
- B. All additional testing and work that is the result of a failed inspection and/or test shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 321613

SECTION 321723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all labor, equipment and services for pavement markings of types, patterns, sizes and colors as shown on the plans and as specified herein:

1.2 LUMP SUM PRICE

- A. The items listed in the proposal shall be considered sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for all material, equipment, labor, testing, construction supervision and all other work required for satisfactory completion of pavement marking.

1.3 UNIT PRICES

- A. None this Section.

1.4 SUBMITTALS

- A. Certifications: Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for the following:
 - 1. Paints
 - 2. Reflective Media
 - 3. Thermoplastic Material

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver paints and paint materials in original sealed containers that plainly show the designated name, specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer. Provide storage facilities at the job site for maintaining materials at temperatures recommended by the manufacturer.

1.6 REGULATORY REQUIREMENTS

- A. Comply with federal, state, and local regulations.

1.7 QUALITY ASSURANCE

- A. Materials: All material submittals shall be submitted by the contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.
- B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.
- C. Subcontractor: A subcontractor for any part of the work must have experience on

similar work. At the option of the Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.

- D. Environmental Conditions: Unless otherwise approved by the manufacturer's written instructions, apply paint to clean, dry surfaces, and unless otherwise approved, only when air and pavement temperatures are above 40°F for oil-based materials, 50°F for water-based materials, and less than 95°F. Maintain paint temperature within these same limits.
- E. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Paints: Federal Specification TT-P-1952, color as indicated.
- B. Reflective Media: Federal Specification TT-B-1325, Type I, Gradation A.
- C. Thermoplastic Materials: In accordance with South Carolina Department of Transportation Standard Specifications for Highway Construction (SCDOT SSHC).

PART 3 - EXECUTION

3.1 PREPARATION OF SURFACE

- A. Prepare surface in accordance with manufacturer's written instructions.
- B. Allow new pavement surfaces to cure as recommended by the manufacturer's written instructions or 30 days if not specified by the manufacturer.
- C. Except as otherwise specified by the manufacturer's written instructions:
- D. Thoroughly clean surfaces to be marked before application of the paint. Remove dust, dirt, residual curing compounds and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, waterblasting or a combination of these methods as required. Scrub affected areas, where oil or grease is present on old pavements to be marked, with several applications of trisodium phosphate solution or other approved detergent or degreaser and rinse thoroughly after each application. After cleaning oil-soaked areas, seal with shellac or primer recommended by the manufacturer to prevent bleeding through the new paint. Do not commence painting in any area until pavement surfaces are dry and clean.

3.2 APPLICATION

- A. Rate of Application
 - 1. Paint: Apply paint evenly to the pavement area to be coated at a rate of 105 SF/GAL plus or minus 5 SF/GAL.

2. Reflective media: Apply glass spheres uniformly to the wet paint on road and street pavement at a rate of 6 lbs./GAL plus or minus 0.5 lbs./GAL.
 3. Thermoplastic material: Apply in accordance with SCDOT SSHC.
- B. Painting: Provide guidelines and templates as necessary to control paint application. Take special precautions in marking numbers, letters, and symbols. Manually paint numbers, letters, and symbols. Sharply outline all edges of markings. The maximum drying time requirements of the paint specifications will be strictly enforced, to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. Discontinue painting operations if there is a deficiency in drying of the markings until cause of the slow drying is determined and corrected.
 - C. Reflective Media: Application of reflective media shall immediately follow the application of paint. Accomplish drop-on application of the glass spheres to ensure even distribution at the specified rate of coverage. Should there be a malfunction of either paint applicator or reflective media dispenser, discontinue operations until deficiency is corrected.
 - D. Curing: Allow markings to cure in accordance with manufacturer's written instructions.

3.3 PROTECTION

- A. Protect new markings from adverse weather and traffic as recommended by the manufacturer's written instructions.
- B. As required, place warning signs near the beginning of the work site and well ahead of the work site for alerting approaching traffic from both directions. Place small markers along newly painted lines to control traffic and prevent damage to newly painted surfaces. Mark painting equipment with large warning signs indicating slow-moving painting equipment in operation.

3.4 INSPECTIONS

- A. Notify the Owner, Project Representative and Engineer a minimum of 72 hours prior to all required observations, inspections or tests.
- B. All work conducted and materials furnished shall be subject to review by the Engineer or the Project Representative. The Engineer will also have the right to require that any portion of the work be conducted in his presence.
 1. If the work is covered after such instruction, it shall be exposed by the Contractor for observation.
 2. However, if the Engineer is notified that such work is scheduled and the Engineer fails to appear within 72 hours, the Contractor may proceed without him.
- C. All improper work shall be reconstructed and all materials which do not conform to the requirements of the specifications shall be removed from the work upon written notice.
 1. The Engineer shall have the right to mark materials as rejected to distinguish them as such.

3.5 ACCEPTANCE

- A. Final acceptance will be based on satisfactory construction of markings as approved by

the Owner and/or Engineer. Markings shall be re-worked to the satisfaction of the Engineer until specified requirements are met.

- B. All additional work that is the result of failed inspection shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 321723

SECTION 331113 - PUBLIC POTABLE WATER UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers work associated with the furnishing and installation of water distribution piping and related components outside the building for described elements of water supply system to include backflow preventers, valves, hydrants, thrust restraints and thrust blocking.

1.2 PUBLIC UTILITY

- A. The work shall be performed, installed, constructed, tested and approved in accordance with published specifications, standards, details and criteria of the Public Utility.
- B. Public Utility that shall approve, operate and maintain the water supply system is:
 - 1. Grand Strand Water & Sewer Authority (GSWSA)
- C. The Public Utility Specifications are hereby incorporated as part of this specification and may be available from the Utility's website.
- D. The Contractor selected to install the potable water system must be on the Public Utility's approved Contractor List, if applicable.

1.3 DEFINITION

- A. Water distribution includes underground water-service piping and associated components outside the building.
- B. Water-service piping conveys potable water to the building for domestic water distribution inside the building.
- C. Fire-service-main piping conveys water to the building for fire suppression.

1.4 LUMP SUM PRICE

- A. The items listed in the Bid shall be considered sufficient to complete the work in accordance with the drawings and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for the excavating, filling, transporting of material, compaction, shaping, finishing, dressing, disposal of surplus material, inspection, testing, staking, construction supervision and all other work required for satisfactory installation of the potable water system.

1.5 UNIT PRICES

- A. None this Section.

1.6 SUBMITTALS

- A. Certifications: Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for each of the following to be used in this project:

1. Water Main Piping;
2. Water Service Piping;
3. Valves, backflow preventers, hydrants, valve boxes and other appurtenances

B. NFPA 24 Certification

1. The Contractor shall perform all flushing, testing, and material certification in order to complete a "Contractor's Material and Test Certificate" in accordance with NFPA 24 requirements for all underground fire protection piping from the branch at water main to the sprinkler riser.
2. The completed, signed certificate shall be provided to the Owner's representative; with copies to the project Architect and Engineer.

C. Laboratory Testing: Submit testing data as required by the Public Utility and SCDHEC:

1. Bacteriological Testing

D. Field Testing: Perform field testing data as required by the Public Utility and SCDHEC:

1. Hydrostatic and Leakage Testing

E. Operational Closeout Documentation: Provide documentation required by the Public Utility and SCDHEC to place the system into operation. Items include but are not limited to:

1. Record Drawings
2. Valve Cards
3. Easement Plats with Legal Descriptions
4. Utility System Cost Summaries
5. Guarantee / Warranty Documentation

1.7 REGULATORY REQUIREMENTS

- A. Comply with Federal, State, and local regulations.
- B. Comply with the requirements of the land disturbance permit and stamped approved drawings issued for this project by South Carolina Department of Health and Environmental Control (SCDHEC) and/or the MS4.
- C. Comply with the requirements of the Water Supply Construction Permit issued by South Carolina Department of Health and Environmental Control (SCDHEC), Encroachment Permit issued by South Carolina Department of Transportation (SCDOT, installation approval issued by the Public Utility, and the approved drawings and specifications for this project.

1.8 SPECIAL WARRANTY / GUARANTEE

- A. Contractor guarantees to repair or replace components of water system that fail in materials or workmanship for a period of two years from the date of commissioning the water system.

1.9 PRECONSTRUCTION CONFERENCE

- A. The Contractor shall be responsible for coordinating his construction with the Public Utility. A Pre-Installation Meeting shall be held with the Public Utility prior to construction. The Contractor shall notify the Public Utility and Engineer a minimum of 72 hours in advance of the meeting.

PART 2 - PRODUCTS

2.1 PUBLIC UTILITY

- A. All products shall be furnished, installed, tested and approved in accordance with published specifications, standards, details and criteria of the Public Utility.

PART 3 - EXECUTION

3.1 PUBLIC UTILITY

- A. The work shall be performed, installed, constructed, tested and approved in accordance with published specifications, standards, details and criteria of the Public Utility.

3.2 RECORD DATA

- A. The Contractor shall keep accurate, legible records of the location of all piping, valve, hydrants and backflow preventors. These records will be made available to the Engineer before his final review for incorporation into the Record Drawings. Final payment to the Contractor will be withheld until all such information is received and accepted.

3.3 INSPECTIONS

- A. Notify the Owner, Project Representative, Engineer and Authority Having Jurisdiction (AHJ) a minimum of 72 hours prior to all required observations, inspections or tests.
- B. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation.
 - 1. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him.
- C. All work completed and materials furnished shall be subject to review by the Engineer or the Project Representative.
- D. All improper work shall be reconstructed and all materials which do not conform to the requirements of the specifications shall be removed from the work upon written notice.
 - 1. The Engineer shall have the right to mark materials as rejected to distinguish them as such.

3.4 TESTING

- A. All testing shall be made at the Contractor's expense.
 - 1. Test locations shall be approved by the Engineer.
- B. The Testing Laboratory, Engineer and Owner shall be given a 72 hour notice, minimum, prior to all required tests.
- C. Test results shall be furnished to the Contractor, Engineer and Owner within 72 hours after tests are taken.
- D. Hydrostatic and Leakage Tests

1. The Engineer **must** witness and approve these tests.
2. The pipe shall be tested at 1.5 times the working pressure in accordance with AWWA C600, Section 4 - Hydrostatic Testing. However, in no case will test pressure be less than 150 psi.
3. The test shall be conducted for at least two hours and a pressure of 150 psi shall be maintained during the test.
4. Should any test of the pipe laid disclose leakage greater than the above specified, the Contractor shall at his own expense, locate and repair the defective joints until leakage is within the specified allowance.

E. Bacteriological Testing (Disinfection)

1. After the hydrostatic and leakage tests have been completed, disinfect water pipes in accordance with AWWA C651 and the regulations of SCDHEC and the Public Utility.
2. Collect a minimum of two (2) samples from each sampling site for total coliform analysis. The number of sites depends on the amount of new construction, but must include all dead- end lines, be representative of the water in the newly constructed mains, and shall be collected a minimum of every 1,200 linear feet.
3. Prior to sampling, the chlorine residual must be reduced to normal system residual levels or be non-detectable in those systems not chlorinating.
 - a. The chlorine residual must also be measured and reported.
4. If the membrane filter method of analysis is used for the coliform analysis, non-coliform growth must also be reported.
5. If the non-coliform growth is greater than eighty (80) colonies per one hundred (100) milliliters, the sample result is invalid and must be repeated.
6. All samples must be analyzed by a State certified laboratory.
7. The Owner and Engineer shall be provided copies of each report within 72 hours of the time the test was performed.
8. NOTE: SCDHEC only considers these tests valid for a 30-day period.
 - a. The Contractor is responsible for coordinating testing schedules with the Engineer and Public Utility in a manner to ensure that all associated closeout documentation (as-built drawings, easement plats, waiver of liens, etc.) can be finalized within 30 days of the tests.
 - b. The Engineer shall be given a minimum of one week for review of the tests.
 - c. All additional work, which is the result of expired tests, shall be performed by the Contractor at no additional cost to the Owner.

3.5 OPERATIONAL CLOSEOUT DOCUMENTATION

A. As-Built (Record) Drawings and Valve Cards

1. Upon completion of installation of the potable water system, a Land Surveyor registered in the State of South Carolina shall prepare and provide Preliminary Record Drawings and Valve Cards to the Engineer for review.
 - a. As a minimum, these drawings shall show all pipe sizes, materials, valves, fittings, fire hydrants, and pertinent data input as attributes as required by the Public Utility and SCDHEC, and **tied to State Plane Coordinates**.
 - b. Record drawings shall accommodate both the Surveyor's and the Engineer's certifications, seals, and signature.
2. After review by the Engineer and Public Utility, the Surveyor shall make all required changes and/or revisions and submit to the Engineer signed and sealed sets along with electronic media.

3. Contractor shall include in his project schedule 30 calendar days for the approval of the as- built drawings by the Public Utility and/or SCDHEC after incorporation of Engineer's comments.

B. Easement Plat

1. Upon completion of installation of the potable water system, a Land Surveyor registered in the State of South Carolina shall prepare and provide Preliminary Easement Plats and Legal Description(s) as required by the Public Utility and for recording at the appropriate County RMC Office.
 - a. Easement Plats shall be tied to State Plane Coordinates.
2. After review by the Engineer and Public Utility, the surveyor shall make all required changes and/or revisions.
3. The surveyor shall be responsible for recording the plat(s) at the appropriate County RMC Office, unless instructed otherwise.
4. The Surveyor is required to provide to the Engineer signed and sealed sets with recording information, along with electronic media.
5. Contractor shall include in his project schedule 30 calendar days for the approval of the easement plat by the Public Utility after incorporation of Engineer's comments.

3.6 ACCEPTANCE

- A. Final acceptance will be based on satisfactory materials, installation and construction of the specified work as approved by the Engineer. All construction shall be re-worked to the satisfaction of the Public Utility, Owner and/or Engineer until specified requirements are met.
- B. All additional work that is the result of a failed inspection or test shall be performed by the Contractor at no additional cost to the Owner.

SECTION 331113

SECTION 33213 – PACKAGED ON-SITE SANITARY SEWER SEPTIC SYSTEM

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 31 23 16 Excavation

1.2 DESCRIPTION

- A. The Contractor shall furnish all labor, material, tools and perform all work and services necessary for or incidental to the furnishing and installation, complete all operations in connection with the settling tank or residential pump station as shown on drawings and as specified in accordance with provisions of the contract documents, and completely coordinated with that of all other trades.
- B. The Contractor shall arrange all inspections necessary for the installation of his work and shall coordinate with Onsite Septic Engineering, furnishing the Engineer with certificates of inspection from all governing authorities.

1.3 WORK INCLUDED

- A. 1,000 gallon Septic tank
- B. 1,000 gallon pump station including STEP package and control panel
- C. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, complete and compatible installation shall be furnished and installed as part of this work. This section includes the installation of the settling tank or residential pump station and all required appurtenances. The installation of the residential pump station shall include the service line from the tank to the force main. All tanks shall include a plugged 4" wye on the inlet side of the tank.

1.4 SUBMITTALS

- A. Precast Concrete Settling Tank

- 1. When requested, concrete tank manufacturers shall submit the following information:

- a. A structural analysis and design calculations showing that the allowable stresses will not be exceeded during manufacture, handling, shipping, installation, testing and service.
 - b. Daily results of concrete test cylinders.

- 1) Testing of concrete strengths by means of test cylinders is a critical part of the quality control program. Concrete shall be sampled and cylinders made in accordance with the following specifications:

- a) ASTM C31 - Specification for making and curing concrete test specimens in the field.
 - b) ASTM C172 -Specification for sampling fresh concrete.
 - c) ASTM C192 -Specification for making and curing concrete test specimens in the laboratory.

- 2) A minimum of four test cylinders per day shall be made to indicate 7-day and 28-day

test strength, or strength at an earlier age, to verify handling strength.

c. Cement and reinforcing mill reports shall be available for review if requested.

B. STEP Pumps And Related Appurtenances

1. Instructions
2. Complete instructions covering all wiring diagrams trouble shooting data shall be included with each control box, and complete servicing and installation instructions for pumps shall be included with each pump.

C. Certified Pump Performance Testing

1. Each pump shall be tested at the factory and certified by the manufacturer as to flow and head output. Copies of the test results for each pump shall be furnished with the pump.

1.5 WARRANTY

- A. The Contractor shall warrant to the Owner each complete tank installation for defects in materials and workmanship for a period of one year from the date SCHEC approves the Settling Tank/STEP system for operation.
- B. The tank manufacturer shall warrant their tanks to remain watertight and structurally sound for a period of three (3) years from date of manufacturer, and for at least two (2) years after delivery to the job site. This warranty includes any joints and fittings installed by the manufacturer.
- C. The manufacturer warranty shall not relieve the contractor of any obligations under his warranty to the Owner.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Pre-cast tanks for STEP systems shall be provided with a groove suitable for joining a reinforced concrete or fiberglass riser pipe to the top of the tank wall. The groove shall be concentric with the inlet access manhole openings on the Drawings.
- B. Self-adhering asphalt sealant strip for sealing tank joints shall be supplied by the manufacturer for all tanks and installed in all tanks. Fiberglass access covers for STEP systems shall have the dimensions indicated on the Drawings and shall be pre-approved by the Authority. All hardware shall be stainless steel. Inlet and outlet pipes shall be affixed to the structure using a flexible neoprene boot. Formed holes shall be perpendicular to the face of the tank wall and properly plugged so as to produce a smooth walled hole. The boot shall be Kor-N-Seal Assembly as manufactured by National Pollution control Systems, Inc. of Milford, New Hampshire, or equal. The boot shall be provided in accordance with the manufacturer's specifications and as shown on the Plans.

2.2 PRECAST SETTLING TANK

- A. Capacity of the settling tank shall be 1,000 gallons minimum. Either polyethylene or concrete septic tanks are acceptable. Fiberglass reinforced plastic is not considered equal as an alternate material.
- B. All concrete settling tanks shall be manufactured by a PCI certified plant and meet ASTM C- 478

or ASTM c-890 and ACI 318-83 or the latest revision. All tanks shall be built to the dimension shown on the plans and designed and certified by the manufacturer to meet H-20 loading. Design information shall be provided before any tanks are approved. All tanks shall be installed level and at the location determined by the Authority/Engineer. The settling tanks shall be watertight and free of defects upon installation.

C. Design

1. Design calculations shall be prepared for review and approval by the Engineer. The design shall address all aspects required to produce a watertight tank suitable for the intended purpose including, but not limited to, the following:
 - a. Cement Type
 - b. Form Release
 - c. Water
 - d. Concrete Placement
 - e. Aggregates
 - f. Joints
 - g. Admixtures
 - h. Water Stops
 - i. Mix Design
 - j. Curing & Protection
 - k. Reinforcing
 - l. Tolerances
 - m. Accessories
 - n. Finish
 - o. Forms
 - p. Testing
 - q. Form Ties
 - r. Repair

D. Minimum Requirements

1. Precast concrete septic tanks shall also meet the following minimum requirements
 - a. Precast reinforced concrete walls shall have a minimum thickness of 4 inches.
 - b. Precast reinforced concrete tops shall have a minimum thickness of 4 inches.
 - c. Concrete shall have a minimum compressive strength of 5,000 psi at 28 days.
2. All tanks shall be cured by an approved method and not be shipped until:
 - a. The sections have attained the concrete design compressive strength.
 - b. The tanks have passed the specified vacuum test.
 - c. Seven days after fabrication and/or repair, whichever is the latter, have elapsed.
 - d. Self-adhering asphalt sealant strip for sealing tank joints shall be supplied by the manufacturer for all tanks.
 - e. The maximum water/cement ratio shall be 0.45.

E. Cements

1. Sulfate resistant cement shall be used conforming to the following specifications:
 - a. Portland cement ASTM C150, Types I, IA, II, IIA, III, IIIA, or V.
 - b. Portland plant furnace slag cement ASTM C595, Types IS (MS) or IS-A (MS).
 - c. Portland pozzolan cement ASTM C595, Type IP or IPA, except that the pozzolan content

of the Portland pozzolan cement should not exceed 25% by weight.

These different cements shall not be used interchangeably in the same element or portion of the work.

F. Inlet/Outlet Connections

1. Inlet and outlet pipes shall be sealed watertight and shall be affixed to the structure using a flexible neoprene boot. Formed holes shall be perpendicular to the face of the tank wall and properly plugged so as to produce a smooth walled hole.

G. Reinforcing Steel

1. Reinforcing steel size and placement shall be determined by the design, but in any case not less than Number 4 reinforcing bars at 12-inch centers each way.
2. Reinforcing steel bars shall be firmly held in position, not subject to shifting upon concrete placement. There shall be a minimum distance of 1 inch from center of reinforcement to face.
3. Concrete shall be compacted by vibration. Vibrators may be internal, external, or surface types.
4. Vibrators shall have operating frequencies that produce well-consolidated placements.

H. Appurtenances

1. Settling tanks and settling tanks with pump chambers (STEP tanks) shall be supplied and delivered to the Owner's storage area with all neoprene boots installed.
2. All risers, upper access manhole frame and cover, float mast assembly, pump and wiring shall be supplied for a complete installation.
3. The quality of all materials, the process of manufacture, and the finished tanks, shall be subject to inspection and approval by the Design Engineer and the Authority. Such inspection may be made at the place of manufacture, or on the work after delivery, or at both places. Tanks shall be subject to rejection at any time on account of failure to meet any of the specification requirements; even though sample tanks may have been satisfactory at the place of manufacture. Tanks rejected after delivery shall be immediately removed from the site of the work by the Contractor at his own expense.

2.3 STEP PUMPS AND RELATED APPURTENANCES

- A. Furnish and install one submersible pump in the residential pump (STEP) station as indicated on the drawings. Pump shall be rated 1/3 HP, 120 volt, single phase, providing 40 gpm at 20' total dynamic head. Pumps shall be Zoeller M53/M55 or approved equal.
- B. Motors shall be oil-filled with constant bearing lubrication, and be permanent split capacitor type with no starting switch to fail. The housing shall be cast iron with pressed in stator for best heat transfer and alignment.
- C. The impeller shall be of the recessed vortex bronze design, with an unobstructed passage in the volute case which allows the passage of stringy trash and slurries without plugging the impeller. Pump shall be designed to pass a .5 inch diameter solid.
- D. Pump shall have a mechanical seal constructed of carbon and ceramic.
- E. Level Controls
 1. Pump on and off levels, shall be controlled by low voltage mercury float switches.
 2. Mercury switches shall be sealed in solid polyurethane float ball.
 3. Float switches shall be mounted on a stainless steel bracket so that they can be cleaned or

replaced without disturbing pump or piping.

F. Discharge Package – Service Lateral

1. Quick release discharge piping with 1-1/2" PVC/plastic ball valve:
2. A 1-1/2" plastic ball check valve shall be installed in a vertical position within the tank. A redundant 1-1/2" ball check valve shall be placed at the service saddle connection to the main. Flomatic or approved equal.
3. Installation shall include a 1-1/2" Schedule 40 PVC and fittings from pump to force main including tapping saddle, 1-1/2" corporation stop or Teflon coated ball valve when a tee is used, and redundant 1-1/2" ball check valve.

G. All piping, PVC True Union valves and appurtenances shall be per standard details provided for this application.

H. 1/2" Dacron rope shall be provided for lifting pump.

PART 3- EXECUTION

3.1 GENERAL

- A. Location of all tanks shall be approved by Owner Engineer.
- B. Installer must be an SCDHEC Tier 3 Installer and contact Onsite Septic Engineering to schedule Pre-Construction Meeting and for all construction observations prior to installation.
- C. Installation must be done in accordance to meet all requirements of SCDHEC Regulation 61- 56

3.2 PRECAST SETTLING TANK TESTING

- A. All tanks delivered will be water tested and/or tested to an applied vacuum by the manufacturer.
- B. The tank shall be evacuated through one plug using a vacuum pump to the required pressure. The Contractor shall supply three sets of plugs, fittings and coupling as necessary to close the tanks for testing.
- C. At least one (1) plug in each set shall include piping through the plug and have connection for evacuating the tank when the plugs are in place.
- D. The Authority reserves the right to test any or all tank(s) for water tightness at no additional cost to it.
- E. Testing method shall be determined by the Design Engineer and may be either/or both a vacuum test or a test conducted by filling the tank with water.
- F. The vacuum test will be performed by applying a vacuum of 4 inches of mercury for five (5) minutes. Vacuum readings will be taken at one minute intervals for five (5) minutes. Tanks that show a drop greater than 1" or do not show a stabilized pressure after (5) minutes will be considered to have failed the vacuum test.
- G. The water test will be performed by filling the tank with water for 24 hours after all tank openings and penetrations have been plugged and sealed. Tanks shall show no leakage from section seams, pinholes, or other imperfections.

- H. The intent of the vacuum and water tests is to ensure the Authority that structurally sound and watertight tanks are provided.
- I. The above tests will be performed at the Contractor's storage facility after the tank has been delivered and assembled by the manufacturer.
- J. Tanks will be rejected which do not meet the requirements specified herein when inspected by the Engineer/Authority upon delivery to the construction site. Tanks will also be rejected which fail to pass the specified vacuum test in a maximum of three (3) attempts.

END OF SECTION 33213

SECTION 334100 - SITE STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers all work associated with the excavation, installation and construction, backfilling and testing for storm drainage piping and structures as indicated on the drawings and as specified herein.

1.2 DEFINITIONS

- A. Subgrade: Existing, in-situ soil or other material that is remaining after stripping or excavation. The subgrade is always existing material on which fill or new structures are to be placed.
- B. Excavation: The removal of soil or material to obtain a specified depth or elevation.
- C. Borrow: Material that must be transported to the site. A material that must be developed by others and transported to the site. Not available on site.
- D. Backfill: Fill material used in refilling a cut, trench or other excavation.
- E. Lift: A layer or course of material placed on top of a previously prepared or placed material.
- F. Unsuitable Material: Existing, in situ soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in fill or embankment without excessive consolidation or loss of stability. Materials classified as PT, OH, or OL by ASTM D 2487 are unsuitable. Unsuitable materials also include man-made fills, refuse, frozen material, uncompacted backfills from previous construction, unsound rock or soil lenses, or other deleterious or objectionable material.
- G. Granular Material: Soils classified as GW, GP, SW or SP by ASTM D 2487. Materials classified as GM and SM will be identified as granular only when fines have a plasticity index of zero.
- H. Compaction: The process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "*Degree of Compaction*" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D1557 for general soil types or ASTM D 4253 or ASTM D 4254 for isolated cohesionless materials, abbreviated in this specification as " percent maximum density".
- I. Drainage Structure: Any structure constructed as part of the storm drainage collection or removal system. This includes catch basins, curb inlets, control structures, headwalls, flared end sections, junction boxes and manholes.
- J. Bedding: The subgrade or fill material that directly supports the load of a pipe.

1.3 LUMP SUM PRICE

- A. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the drawings and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for the excavating, filling, transporting of material, compaction, shaping, finishing, dressing, disposal of surplus material, testing, staking, construction

supervision and all other work required for satisfactory completion of the storm drainage operations.

B. Base bids on the following criteria:

1. Surface elevations as indicated.
2. No pipes or other man-made structures other those indicated will be encountered. The utility locations shown are based on available information and are approximate and shall be field verified prior to beginning any work.
3. The character of the material to be excavated or used for subgrade is as indicated.
4. Ground water elevations indicated are those existing at the time of subsurface investigations and do not necessarily represent ground water elevation at the time of construction.
5. Borrow material in the quantities required are not available on site and must be developed and obtained by the Contractor.

1.4 UNIT PRICES

A. None this Section.

B. Options

1. Where not specifically indicated in these specifications or on the drawings, the Contractor will have the option of using the pipe materials identified for the appropriate use.

1.5 SUBMITTALS

A. Plans

1. Dewatering Plan: Describe methods for removing collected water from open trenches and diverting surface water or piped flow away from work area. Describe equipment and procedures for installing and operating the dewatering system indicated. Describe the basic components of the dewatering system proposed for use and its planned method of operation. Record performance and effectiveness of method or system in use. The dewatering plan shall address, as a minimum, the requirements identified in the paragraph titled "Drainage and Dewatering"
2. Shoring and Sheet piling Plan: Describe the materials of the shoring system to be used. Indicate whether or not components will remain after filling or backfilling. Provide plans, sketches, or details along with calculations by a professional engineer. Indicate sequence and method of installation and removal.

B. Shop Drawings

1. Pre-Cast Structures and accessories

C. Certifications: Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for the following:

1. Piping

- a. Reinforced concrete pipe (RCP), including fittings and joint materials.
- b. High density polyethylene pipe (HDPE), including fittings and joint materials.
- c. High density polypropylene (PP), including fittings and joint materials.
- d. Polyvinyl chloride pipe (PVC), including fittings and joint materials.
- e. Ductile iron pipe (DIP), including fittings and joint materials.

2. Perforated Drain Piping

- a. HDPE less than 12 inch diameter.

- b. HDPE equal to or greater than 12 inch diameter.
 - c. PVC 4 inch and 6 inch only.
- 3. Pre-cast structures.
- 4. Cast iron frames, covers and gratings.
- 5. Cleanout materials.
- D. Laboratory Testing: Submit testing data as identified in the paragraph titled "Laboratory Testing" for any of the following materials to be used on the project. Obtain approval before any material is delivered to the site.
 - 1. Subgrade
 - 2. Common fill
 - 3. Controlled fill
 - 4. Granular fill
- E. Field Testing: Submit field testing data as identified in the paragraph titled "Field Testing" for the following:
 - 1. Compaction and density tests for subgrade, excavation and fill/backfill
 - 2. Leakage tests
 - 3. Dye test
- F. Inspection Reports
 - 1. Pipeline Post Installation Inspection Report

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Storage
 - 1. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store plastic piping, jointing materials, and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris
 - 2. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.
- B. Handling
 - 1. Handle pipe, fittings, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care not to damage coatings and linings on pipe and fittings; if damaged, make repairs. Carry pipe to trench - do not drag.

1.7 REGULATORY REQUIREMENTS

- A. Comply with federal, state, and local regulations.
- B. Comply with the requirements of the land disturbance permit and stamped approved drawings issued for this project by the South Carolina Department of Health and Environmental Control (SCDHEC) and/or the MS4.

1.8 QUALITY ASSURANCE

- A. Materials: The Contractor will furnish the Engineer and Owner all submittals identified in the

paragraph "Submittals" before ordering. The Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.

- B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of two years and who provides published data on the quality and performance of the projects.
- C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the contacts who are familiar with his competence may be required to be submitted to verify experience.
- D. Design: Devices, equipment, structures, and systems not designed by the Engineer that the Contractor wishes to furnish shall be designed by either a registered professional engineer or by someone the Engineer accepts as qualified. Complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.
- E. Testing Agencies: Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test. Agencies to be used shall be submitted to the Engineer for review prior to engagement.

PART 2 - PRODUCTS

2.1 CONCRETE PIPE

- A. Circular concrete pipe shall be reinforced concrete pipe (RCP) conforming to ASTM C76, Class III. Provide Class IV as indicated on the drawings.
- B. Joints, including pipe and gasket material, shall meet ASTM C443 for bell & spigot or modified tongue & groove with O-ring rubber gasket.
- C. Joint Sealants
 - 1. O-Ring or Profile Gasket
 - a. ASTM C443 and the manufacturer's recommendations.
 - b. Installed at all locations.
 - 2. Mastic/Butyl gaskets shall not be used.

2.2 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

- A. Less than 12 inch diameter
 - 1. ASTM F2648 or AASHTO M252, Type S.
 - 2. Fittings and joints shall be at least the strength and capacity of the pipe and meet the requirements of ASTM F2306 or AASHTO M252, Type S.
 - 3. Joints shall be soil-tight using an engaging dimple connection.
- B. Equal to or greater than 12 inch diameter
 - 1. ASTM F2648 or AASHTO M294, Type S.
 - 2. Fittings and joints shall be at least the strength and capacity of the pipe and meet the

- requirements of ASTM F2306 or AASHTO M294, Type.
 - 3. Joints shall be soil-tight using an engaging dimple connection.
 - C. The use of single wall, Type C pipe, is prohibited.
 - D. Pipe and fitting shall be manufactured by one manufacturer.
- 2.3 HIGH DENSITY POLYPROPYLENE (PP) PIPE
- A. ASTM F2881 or AASHTO M330.
 - B. Fittings and joints shall be at least the strength and capacity of the pipe and meet the requirements of ASTM F2881 or AASHTO M330.
 - C. Watertight joints shall meet the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477.
- 2.4 POLYVINYL CHLORIDE (PVC) PIPE
- A. Pipe shall meet ASTM D3034, SDR 35, having ends adaptable for elastomeric gasket joints.
 - B. Joints shall conform to ASTM D3212.
 - C. Gaskets shall conform to ASTM F477.
- 2.5 PERFORATED DRAIN PIPE
- A. Perforated HDPE Piping
 - 1. Less than 12 inch diameter: AASHTO M252, Type SP.
 - 2. Greater than or equal to 12 inch diameter: AASHTO M294, Type SP
 - 3. HDPE perforated pipe shall be wrapped with subsurface drainage filter fabric in accordance with AASHTO M288-92, Class A.
 - A. Perforated PVC Piping (4 and 6 inch diameter only)
 - 1. ASTM D2729.
- 2.6 DRAINAGE STRUCTURES
- A. Construct of pre-cast concrete. Structures may be constructed of solid concrete masonry or cast-in-place concrete, in lieu of pre-cast concrete. Catch basins, headwalls, gutters, top of curb inlets, and bases shall be cast-in-place concrete.
 - 1. Pipe-to-wall connections shall be mortared to produce smooth transitions and watertight joints or provided with ASTM C923 resilient connectors.
 - 2. Bases shall have smooth inverts accurately shaped to a semicircular bottom conforming to the inside contour of the adjacent sewer sections.
 - 3. Changes in direction of the sewer and entering branches into the manhole shall have a circular curve in the manhole invert of as large a radius as the size of the manhole will permit.
 - B. Concrete
 - 1. Cast in place concrete shall be in accordance with SECTION "SITE WORK CONCRETE".

2. Pre-cast concrete manholes shall be in accordance with ASTM C478.

Provide a minimum wall thickness of 5 inches.

3. Pre-cast concrete catch basins, curb inlets and junction boxes shall be in accordance with ASTM C913. Provide a minimum wall thickness of 6 inches.
4. Reinforcing bars shall be in accordance with ASTM A615 and welded wire fabric shall be in accordance with ASTM A497.
5. Gaskets for joint connections shall be in accordance with ASTM C443 for O-rings and AASHTO M198, Type B for mastic sealants.

C. Masonry

1. Mortar: ASTM C270, Type M.
2. Brick: ASTM C32, Grade MS, or ASTM C62, Grade SW.
3. Concrete Masonry Units (CMU): ASTM C139.
4. Water for masonry mortar shall be fresh, clean, potable.
5. Grout: ASTM C476.

D. Frames, Covers and Grates

1. Castings shall be of uniform quality, free from blowholes, shrinkage, distortion and other defects. Metal used shall conform to ASTM A48-83, Class 35B for gray iron or ASTM A536- 80, Grade 65-45-12 for ductile iron.
2. Frames and covers shall have continuously machined bearing surfaces to prevent rocking.
3. Dimensions shall be as indicated on the drawings, as a minimum. Variations in dimensions will be accepted provided that hydraulic capacity and load capacity are equal to or greater than that shown.
4. The Contractor is responsible for all coordination due to varying dimensions for frames and grates.

- E. Flared end sections shall be same material as pipe material unless indicated otherwise. Flared ends are included in the lengths of pipe indicated.

2.7 SOIL MATERIALS

- A. Provide rip rap in accordance with SECTION "RIP RAP".
- B. Provide soil materials as specified below free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, ice, or other deleterious and objectionable materials.
- C. Bring trenches to grade indicated on the drawings using material excavated on the site of this project provided that the material is Class I, II, or III as defined in SECTION "EARTH MOVING". In the event that material available on site does not meet Class I, II, or III, import material as required at no additional cost to the Owner.
- D. Backfill trenches under roads, structures, and paved areas with controlled fill as specified in SECTION "EARTH MOVING".

PART 3 - EXECUTION

3.1 GENERAL

- A. Cutting Pavements, Curbs and Gutters

1. Saw cut with neat, parallel, straight lines 1 foot wider than trench width on each side of trenches and 1 foot beyond each edge of pits. When the saw cut is within 3 feet of an existing joint, remove pavement to the existing joint.
- B. Location: Storm drainage piping and structures shall be at the locations, grades, inverts, and slopes indicated.

3.2 EARTHWORK

- A. Topsoil: Strip, stockpile and place topsoil in accordance with SECTION "EARTH MOVING".

B. Excavation

1. Keep excavations free from water while construction is in progress.
2. Immediately notify the Engineer, in writing, if it becomes necessary to remove rock or hard or unsuitable material to a depth greater than indicated.
3. Make trench sides as nearly vertical as practicable except where sloping of sides is allowed. Sides of trenches shall not be sloped from the bottom of the trench up to the elevation of the top of the pipe.
4. Excavate ledge rock, boulders, and other unyielding material to an overdepth at least 6 inches below the bottom of the pipe and appurtenances unless otherwise indicated or specified. Overexcavate unsuitable material as indicated.
5. Use granular fill placed in 6 inch maximum layers to refill overdepths to the proper grade. At the Contractor's option, the excavations may be cut to an overdepth of not less than 4 inches and refilled to required grade as specified.
6. Grade bottom of trenches accurately to provide uniform bearing and support for each section of pipe or structure on undisturbed soil, or bedding material as indicated or specified at every point along its entire length except for portions where it is necessary to excavate for bell holes and for making proper joints. Dig bell holes and depressions for joints after trench has been graded. Dimension of bell holes shall be as required for properly making the particular type of joint to ensure that the bell does not bear on the bottom of the excavation. Trench dimensions shall be as indicated.

C. Bedding

1. Bedding shall be of materials and depths as indicated or specified for storm drainage piping and structures.
2. Place bedding in 6 inch maximum loose lifts.
3. Provide uniform and continuous support for each section of structure except at bell holes or depressions necessary for making proper joints.

D. Backfilling

1. Construct backfill in two operations (initial and final) as indicated and specified in this section.
2. Place initial backfill in 6 inch maximum loose lifts to 1 foot above pipe unless otherwise specified. Ensure that initially placed material is tamped firmly under pipe haunches. Bring up evenly on each side and along the full length of the pipe or structure. Ensure that no damage is done to the utility or its protective coating.
3. Place the remainder of the backfill (final backfill) in 9 inch maximum loose lifts unless otherwise specified. Compact each loose lift as specified in the paragraph entitled "Compaction" before placing the next lift.
4. Do not backfill in freezing weather or where the material in the trench is already frozen or is muddy, except as authorized. Provide a minimum cover from final grade of 2 feet for storm drains.

5. Where settlements greater than the tolerance allowed herein for grading occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation.
6. Coordinate backfilling with testing of storm drain pipes and structures. Testing for the storm drainage pipe and structures shall be complete before final backfilling.

E. Compaction

1. Use hand-operated, plate-type, vibratory, or other suitable hand tampers in areas not accessible to larger rollers or compactors. Avoid damaging pipes and protective pipe coatings. Compact material in accordance with the following unless otherwise specified. If necessary, alter, change, or modify selected equipment or compaction methods to meet specified compaction requirements.
2. Compaction of Bedding Material
 - a. In soft, weak, or wet soils, tamp refill material to consolidate to density of adjacent material in trench wall. In stable soils, compact to 90% of maximum density.
3. Compaction of Backfill
 - a. Compact initial backfill material surrounding pipes to 90% of maximum density except where bedding and backfill are the same material. Where bedding and backfill are the same material, compact initial backfill to the density of the bedding.
 - b. Under areas to be seeded or sodded, compact succeeding layers of final backfill to 85% of maximum density.
 - c. For utilities under railroad or highway right-of-way, structures and pavements compact succeeding layers of final backfill as specified under SECTION "EARTH MOVING".

F. Structures

1. Provide at least 12 inches clear from outer surfaces to the embankment or shoring. Remove unsuitable material that is incapable of supporting the structure to an overdepth of 1 foot and refill with gravel or sand to the proper elevation. Refill overdepths with gravel, sand or concrete to the required grade and compact as specified.

G. Subsurface Drains

1. Excavation and Backfill
 - a. Excavate to dimensions indicated. Provide a bedding surface of no more than 1 inch of sand, gravel or granular material and place on compacted material as indicated. Backfill around and over the pipes after pipe installation has been approved. Place granular material in 6 inch lifts and compact with mechanical, vibrating plate tampers or rammers until no further consolidation can be achieved. Compact backfill overlying the granular material as specified for adjacent or overlying work.
2. Filter Fabric
 - a. Wrap one layer of filter fabric around pipe in such a manner that longitudinal overlaps are in unperforated or unslotted quadrants of the pipe. Overlap fabric a minimum of 2 inches.
 - b. Secure fabric to pipe so that backfill material does not infiltrate through overlaps.
 - c. Place granular material and extend it for one pipe diameter, minimum of 6 inches on each side, and 18 inches above top of pipe or as indicated.
 - d. Place a layer of filter fabric on top of granular material before continuing with backfill.

3.3 PIPE LAYING AND JOINTING

A. General Requirements

1. Inspect each pipe and fitting before and after installation. Remove those found defective from site and replace with new.
2. Provide proper facilities for lowering sections of pipe into trenches. Lay pipe with the bell or groove ends in the upgrade direction.
3. Adjust spigots in bells and tongues in grooves to produce a uniform space. Blocking or wedging between bells and spigots or tongues and grooves will not be permitted.
4. Replace by one of the proper dimensions any pipe or fitting that does not allow sufficient space for proper caulking or installation of joint material.
5. At the end of each workday, close open ends of pipe temporarily with wood blocks or bulkheads.
6. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose.

B. Connections to Existing Lines or Structures

1. Notify the Engineer in writing at least 7 days prior to date that connections are to be made.
2. Obtain approval of the appropriate Authority Having Jurisdiction (AHJ) before interrupting service.
3. Conduct work so that there is minimum interruption of service on existing line.

C. Concrete Pipe

1. Install pipe and fittings in accordance with the provisions for rubber gasket jointing and jointing procedures of ACPA 01-103 or of ACPA 01-102, Chapter 9.
2. Make joints with the gaskets previously specified for joints with this piping. Clean and dry surfaces receiving lubricants, cements, or adhesives. Affix gaskets to pipe not more than 24 hours prior to the installation of the pipe.
3. Protect gaskets from sun, blowing dust, and other deleterious agents at all times. Before installation of the pipe, inspect gaskets and remove and replace loose or improperly affixed gaskets.
4. Align each pipe section with the previously installed pipe section and pull the joint together.
5. If, while pulling the joint, the gasket becomes loose and can be seen through the exterior joint recess when the pipe is pulled up to within 1 inch of closure, remove the pipe and remake the joint.

D. HDPE Pipe

1. Install in accordance with ASTM D2321 and the requirements of the HDPE pipe manufacturer.

E. PP Pipe

1. Install in accordance with ASTM D2321 and the requirements of PP pipe manufacturer.

F. PVC Pipe

1. Install pipe and fittings in accordance with the paragraph entitled "General Requirements" of this Article and with the requirements of ASTM D2321 for laying and joining pipe and fittings.
2. Make joints with the gaskets specified for joints with this piping; assemble in accordance with the requirements of ASTM D2321 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer

G. Perforated Drain Pipe

1. The laying of pipe and tile shall proceed upgrade from the lower end of the line and shall have a uniform pitch to the outlets.
2. Perforated pipe shall have joints made with standard coupling bands in a manner approved by the Engineer.

3.4 DRAINAGE STRUCTURES

A. Concrete Work

1. Perform cast-in-place concrete work in accordance with SECTION "SITE WORK CONCRETE".

B. Manhole, Curb Inlet and Catch Basin Construction

1. Construct base slab of cast-in-place concrete or use pre-cast concrete base sections.
2. Provide sumps in structures in accordance with the drawings.
3. For cast-in-place concrete construction, either pour bottom slabs and walls integrally or key and bond walls to bottom slab.
4. For pre-cast concrete construction, make joints between sections with the gaskets specified for this purpose; install in the manner specified for installing joints in concrete piping. Give a smooth finish to inside joints of pre-cast concrete structures.
5. Parging will not be required for pre-cast concrete manholes.
6. Cast-in-place concrete work shall be in accordance with the paragraph entitled, "Concrete Work."
7. Make joints between concrete structures and pipes entering structures with the resilient connectors specified for this purpose or mortared to produce a watertight joint; install in accordance with the recommendations of the connector manufacturer.
8. Where a new structure is constructed on an existing line, remove existing pipe as required to construct the structure. Cut existing pipe so that pipe ends are approximately flush with the interior face of structure wall, but not protruding beyond into the structure.

C. Metal Work

1. Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron and steel to shape and size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and free from warp, cold shuts, and blow holes that may impair their strength or appearance. Give exposed surfaces a smooth finish with sharp well-defined lines and arises. Provide rabbets, lugs, and brackets wherever necessary for fitting and support.

3.5 PROTECTION

A. Shoring and Sheeting

1. The Contractor is responsible for the design of all shoring and sheeting systems. Provide shoring, bracing or sheeting where required. In addition to the requirements of Section 25 A and B of COE EM-385-1-1, and other requirements of this contract meet the following:
 - a. Prevent the undermining of pavements, foundations and slabs.
 - b. Slope banks where space permits.
 - c. Where shoring and sheeting materials remain in place in completed work to prevent settlements or damage to adjacent structures as directed, backfill the excavation to 3 feet below the finished grade and remove the remaining portion of the shoring before completing the backfill.

B. Drainage and Dewatering

1. Plan for and provide structures, equipment and construction for the collection and disposal of surface and subsurface water encountered during construction.
2. Drainage: Dispose of surface water which may accumulate in open excavations, unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces. Surface dewatering plan shall include rerouting of any storm water runoff or natural drainage if necessary. Collect and dispose of surface and subsurface water encountered in the course of construction.
3. Dewatering
 - a. Groundwater flowing toward or into excavations shall be controlled to prevent sloughing or excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least 1 foot below the working level.
 - b. Operate the dewatering system continuously, 24 hours per day, 7 days per week until construction work below existing water levels is complete. Have a back-up pump and system available for immediate use.

C. Erosion Control: Protect existing streams, ditches, and storm drain inlets from water-borne soil by the means indicated on the drawings.

D. Existing Utilities

1. All known utility facilities are shown schematically on the drawings and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown on drawings will not relieve the Contractor of his responsibility under this requirement. "Existing Utilities Facilities" means any utility that exists on the project in its original, relocated or newly installed position. The Contractor will be held responsible for the cost of repairs to damaged underground facilities; even when such facilities are not shown on the drawings.
2. The Contractor shall contact all utility companies prior to beginning work and request accurate field location of their respective utility lines.
3. Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

E. Structures and Surfaces

1. Graded areas shall be protected from traffic, erosion, settlement, or any washing away that may occur from any cause prior to acceptance.
2. Any repair or reestablishment of final grades shall be made prior to final acceptance.

F. Disposal of Excavated Materials

1. Dispose of excavated material so that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of any facilities, or be detrimental to the completed work.

3.6 INSPECTIONS

- A. Notify the Owner, Project Representative, Engineer and Authority Having Jurisdiction (AHJ) a minimum of 72 hours prior to all required observations, inspections or tests.
- B. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation.
 - 1. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him.
- C. All work completed and materials furnished shall be subject to review by the Engineer or the Project Representative.
- D. All improper work shall be reconstructed and all materials which do not conform to the requirements of the specifications shall be removed from the work upon written notice.
 - 1. The Engineer shall have the right to mark materials as rejected to distinguish them as such.

3.7 PIPELINE POST-INSTALLATION INSPECTION (PII)

A. General

- 1. Post-Installation inspection (PII) shall be performed on 100% of all pipelines no sooner than 30 calendar days after completion of the pipe installation and final backfill, which includes the embankment and all non-asphalt bases and/or subgrades. Conditions including joint gaps, tears, misalignment, cracks and deformation shall be noted and reviewed by the Engineer. Engineer shall evaluate for the various conditions noted in PII report as outlined in "Guide for Drainage Pipe Evaluation Repair".
- 2. In cases where paving operations will be conducted in less than 30 calendar days after pipe installation, a preliminary inspection of the pipe prior to paving shall be performed to ensure the pipe in areas to be paved meets all evaluation criteria prior to paving operations. Performing a preliminary inspection does not relieve the Contractor from the requirement of completing the post-installation inspection for all pipe, including pipe that is inspected during preliminary inspection, after the prescribed 30 calendar day period.
- 3. Submit to the Engineer a PII Report as described herein.
- 4. All necessary remediation or replacement of pipe as required or determined to be necessary by the Engineer in conformance with this specification shall be the responsibility of the contractor at no additional expense to the owner. All supplemental work items that are affected by the remediation or replacement of pipe shall be the responsibility of the contractor at no additional expense to the owner. The Engineer shall approve all corrective actions before the work is performed and work shall be completed to the Engineers satisfaction. If any pipe requires remediation or replacement it shall be re-inspected after remediation or replacement has been completed. The Post Installation Inspection Report shall include all notes and data from the initial Post Installation Inspection and all subsequent Post Installation Inspections necessary to fulfill the requirements of this specification.
- 5. The Contractor is responsible for ensuring that all post installation requirements are performed in accordance with this section and paragraph "Post Installation Inspection Methods, Tools, and Report". It is the contractor's responsibility before post installation inspection to dewater and remove all debris and sediment from the installed pipe. The Engineer shall be provided an inspection schedule at least seven days in advance of beginning inspection.

B. Post Installation Inspection Methods, Tools and Report

1. The inspection equipment utilized for all post installation inspection of all pipe types shall be capable of delivering accurate, repeatable measurements of all items of interest as described in paragraph "Pipeline Evaluation Criteria". The owner reserves the right to confirm any and all inspection data and defect measurement accuracy to insure the PII report and information included there in meets the requirements outlined in this specification. If the PII report and/or data is found to be in non-conformance the owner shall require the inspections and the report to be corrected as needed. Any re-inspection required by owner or required due to remediation or replacement shall be the responsibility of and at the expense of the contractor.

C. Remote Inspection

1. Perform remote inspection for all pipe types. Remote inspection shall be performed by using a crawler mounted camera. The camera shall incorporate a lens with low barrel distortion and capable of recording video. Remote inspections may also be accomplished with digital side scan technology equipment.
2. A check for deflection shall be performed on all flexible pipe types by either laser profiling or by use of a mandrel. Deflection testing is not required for rigid pipe.
3. The camera technology utilized shall be able to deliver a high quality MPEG2 format video with a standard resolution of 720 X 480 or other format acceptable to the Engineer. A camera with lighting suitable to allow a clear picture of the entire periphery of the pipe shall be used. The camera shall be centered in the pipe both vertically and horizontally and be able to pan and tilt to a 90 degree angle with the axis of the pipe and rotating 360 degrees. Digital 360 Degree side scanning data collection equipment that will allow an image of the entire pipe surface and joint circumferences to be clearly visualized and evaluated is also an approved inspection tool. Equipment to move the camera through the pipe that will not obstruct the camera's view or interfere with proper documentation of the pipe's condition shall be used. The video image shall be clear, focused, and relatively free from roll, static, or other image distortion qualities that would prevent the reviewer from evaluating the condition of the pipe.
4. Furnish a video recording of 100% of all pipe with information at the beginning of the video which clearly identifies the pipe being inspected. The identification shall include the project number, the structure number corresponding to the structure number from project documents, size of pipe, the date and time of inspection, direction of travel from a given landmark, distance from given landmark for all noted deficiencies, and any other identifying factors needed to locate the pipe in the field at a future date. Provide a source of light that allows all areas of concern to be readily observed on the video recording. Furnish the video recording in a digital, reproducible format approved by the Engineer.
5. Move the camera through the pipe at a speed not greater than 30 feet per minute (If Digital 360 side scan technology is used the speed may be increased but should never exceed inspection equipment manufactures recommendations). Mark the video with the distance down the pipe. The distance shall have an accuracy of 1 foot per 100 feet. Stop the camera and pan every joint. If digital scanner technology is used, every joint shall be evaluated.

D. Post Installation Inspection (PII) Report Criteria

1. A written PII Report shall be provided to the Engineer along with corresponding video, laser profiler data on a digital media storage device with pictures. The PII Report shall include a written description of any noted deficiency as outlined in paragraph "Pipeline Evaluation Criteria" for each pipe. The report shall include a still image of these areas along with all field inspection information that indicates why this area is noted. Each still image and description of condition shall also have information that will allow the Engineer to locate and view this issue in the video recording if the inspection was a remote inspection.
2. If a condition continuously occurs along the pipe wall, the report should note the entire area where this condition was found, include at least one still image that best documents the condition and the information necessary to locate the entire condition in the video recording. If

- the Manual Inspection Method is utilized for flexible pipe products, the PII Report shall include the actual field measurements taken for the measurement of all deficiencies of note.
3. The Report shall include type of equipment utilized for the inspection and clearly provides data to prove the equipment used meets this specification. The inspection contractor shall provide a statement of field accuracy achieved for all measurements including plus/minus tolerances. The report shall also include a narrative about required field/measurement calibration and provide proof that all calibration procedures were followed when collecting data within the report.
 4. The PII Report and corresponding electronic media and data as discussed in this specification shall be made part of the permanent project public records.
 5. In order to ensure proper installation of pipe, 100% of all pipelines should be inspected in a safe and effective method using tools that give accurate measurements to provide the Engineer with reports written by trained and competent professionals.

E. Pipeline Evaluation Criteria

1. The following criteria will be applied to all pipe material types and will be utilized to determine the course of action, if any, to be taken when there are cracks, deflections, bulges, creases, tears, spalls, or delaminations in the pipe. The final decision on course of action and acceptability will be determined by the Engineer.
 - a. Cracks in Rigid Pipe
 - 1) Cracks less than 0.01 inches typically do not require repair or remediation.
 - 2) Cracks greater than 0.01 inches and less than 0.05 inches are acceptable. However, multiple cracks of this size in an 8 foot section may require minor repair.
 - 3) Cracks greater than 0.05 inches but less than 0.10 inches are acceptable unless the following additional conditions exist:
 - a) Minor repair is required if the pipe is located in a corrosive environment.
 - b) When vertical offset is less than 0.10 inches, provide minor repair.
 - c) For vertical offset greater than 0.10 inches, a determination will be made by the Department on the repair method or acceptability of the pipe.
 - 4) Cracks greater than 0.10 inches will be given consideration by the Owner to replace the pipe or allow a site specific repair.
 - b. Cracks or Tears in Flexible Pipe
 - 1) For HDPE, PVC or CMP exhibiting any crack/tear, consideration will be given to replace the pipe or allow a site specific repair for any tear that is through the liner of HPDE or for any tear in the wall of CMP or PVC.
 - c. Deflection in Flexible Pipe
 - 1) Base all deflection measurements on the certified-actual inside pipe diameter supplied by the manufacturer or actual measurements obtained on the project.
 - 2) Deflections greater than 0% but less than 5.0% typically do not require repair or remediation.
 - 3) Deflections greater than 5.0% but less than 7.5% will be evaluated and a determination made as to acceptability or replacement.
 - 4) Deflections greater than 7.5% require replacement.
 - d. Joint Separation - All Pipe Types

- 1) For joints that are soil tight, if infiltration of soil is observed and the joint gap is less than AASHTO guidelines and the manufacturer's requirements, provide minor repair. If not able to repair, replace as needed.
 - 2) If infiltration of soil is evident and the joint gap is greater than AASHTO guidelines and greater than manufacturer's recommendations, provide site specific major repair or replace as needed.
- e. Slabbing in Rigid Pipe: Provide a site specific repair or replace pipe.
- f. Spalling in Rigid Pipe: For pipe with spalling that does not have exposed reinforcement, evaluate to determine if a minor repair is necessary. For pipe with spalling that has exposed reinforcement, evaluate to determine if site specific major repair will be appropriate. If not, replace the pipe.
- g. Minor Repairs - All Pipe Types: Minor repairs can be made with approved materials or methods and do not require a site specific analysis. Examples of minor repairs can be found in ASTM C990 14.1 and the ACPA "Post Installation Evaluation and Repair of Installed Reinforced Concrete Pipe" Manual.
- 1) Other repair resources can be found by visiting <http://www.dot.state.fl.us/construction/ContractorIssues/PipeMatrix/MatrixMain.shtm> and choosing the type of pipe under evaluation.
- h. Site Specific Repairs: Shall be designed by a Professional Engineer, sealed and submitted by the contractor for evaluation and approval. Examples of minor repairs can be found in ASTM C990 14.1 and the ACPA "Post Installation Evaluation and Repair of Installed Reinforced Concrete Pipe" Manual.
- 1) Any repairs made to the installed pipe must be certified by the contractor and the repair contractor. This certification will state that all repairs will have the same service life as newly installed pipe.

3.8 TESTING

- A. All testing shall be made at the Owner's expense. Owner will engage a qualified testing agency to perform tests and inspections.
1. Test locations shall be approved by the Engineer.
- B. The Testing Laboratory, Engineer and Owner shall be given a 72 hour notice, minimum, prior to all required tests.
- C. Test results shall be furnished to the Contractor, Engineer and Owner within 72 hours after tests are taken.
- D. Independent Testing Laboratory
1. Independent Testing laboratory shall operate in accordance with ASTM E329 and shall be submitted to the Engineer for approval.
 2. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results.
 3. If any test performed fails to meet these specifications, Independent Testing Laboratory shall immediately notify the Owner, Engineer and Contractor.
 4. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that it may deem necessary.

- a. The Contractor shall provide free access to the site for testing activities.

E. Laboratory Testing

1. Laboratory testing for maximum density and optimum moisture content for subgrade and backfill shall be performed in accordance with ASTM D 1557 for general soil types or ASTM D4253 or ASTM D4254 for isolated cohesionless materials.
2. Laboratory testing for mechanical analysis of subgrade and backfill shall be performed in accordance with ASTM D2487.
3. Laboratory testing for plasticity index of subgrade and backfill shall be performed in accordance with ASTM D4318
4. Frequency of Laboratory Testing
 - a. Native soil subgrade: One maximum density, optimum moisture content, mechanical analysis and plasticity index test for each material encountered that will serve as subgrade.
 - b. Fill/Backfill: One maximum density, optimum moisture content, mechanical analysis and plasticity index for each source and type of material to be used as backfill.

F. Field Testing

1. Earthwork

- a. Field density tests for in-place materials shall be performed in accordance with one of the following:
 - 1) Sand Cone Method: ASTM D1556
 - 2) Balloon Method: ASTM D2167
 - 3) Nuclear Method: ASTM D2922

2. Frequency of Field Testing

- a. Subgrade for structure or pipe bedding
 - 1) One test per 250 LF of piping outside of pavement areas; minimum of 1 per run between drainage structures.
 - 2) One test per 100 LF of piping within pavement areas; minimum of 1 per run between drainage structures.
 - 3) One test per drainage structure.
- b. Backfill for drainage structure or pipe
 - 1) One test per 250 LF of piping per lift outside of pavement areas; minimum of 1 per run between drainage structures.
 - 2) One test per 100 LF of piping per lift within pavement areas; minimum of 1 per run per lift between drainage structures.
 - 3) One test per drainage structure per lift.

3. Dye Test

- a. A dye test must be performed by a licensed plumber for sanitary sewer connections to validate the connections are properly routed into the sanitary sewer system and not the storm sewer system.
- b. Contractor is responsible for coordination and notification. A representative from the AHJ and Engineer shall be present for all testing and must be notified 72 hours prior to any testing.

- c. Test results must be completed and submitted to the Engineer a minimum of 30 days prior to substantial completion.

3.9 AS-BUILT (RECORD) DRAWINGS

- A. Upon completion of installation of the storm drainage system, a land surveyor registered in the State of South Carolina shall prepare and provide Preliminary Record Drawings to the Engineer for review.
 - 1. As a minimum, these drawings shall show all storm drainage structures, storm pipes, pond size (stage/storage table), bottom elevations, top elevations, low flow channels, details of and pond outlet control structures and pertinent data input as attributes as required by the AHJ or MS4, SCDHEC, and tied to State Plane Coordinates.
 - 2. Record drawings shall accommodate the Engineer's seal, signature, and certification.
- B. After review by the Engineer and AHJ, the Surveyor shall make all required changes and/or revisions and submit to the Engineer signed and sealed copies along with electronic media.
- C. Contractor shall include in his project schedule 30 calendar days for the approval of the record drawings by the MS4 and/or SCDHEC after incorporation of Engineer's comments.

3.10 ACCEPTANCE

- A. Final acceptance will be based on satisfactory materials, installation and construction of the specified work as approved by the Owner, AHJ and/or Engineer.
- B. If a tested material or system does not meet or exceed the specified requirements, the Contractor shall perform additional tests as directed by the Owner, AHJ and/or Engineer to adequately define the limits of the material not meeting the specifications.
 - 1. Materials shall be re-tested to the satisfaction of the Owner, AHJ and/or Engineer until specified requirements are met.
 - 2. All additional testing and work that is the result of a failed inspection or test shall be performed by the Contractor at no additional cost to the Owner.

END OF SECTION 334100